VT TUBE NOS P. #61

TM11-303

WAR DEPARTMENT TECHNICAL MANUAL

TEST SETS

I-56-C, -D, -H, -J

WAR DEPARTMENT • 4 MARCH 1944

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TM 11-303

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United States Government Printing Office
Washington : 1944

WAR DEPARTMENT,
WASHINGTON 25, D. C., 4 MARCH 1944.

TM 11-303, Test Sets I-56-C, I-56-D, I-56-H, and I-56-J, is published for the information and guidance of all concerned.

[A. G. 300.7 (6 DEC. 43).]

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R and H 2, 4, 7(2); IBn 11(2); IC 2, 4, 5, 6, 7, 17, 18(2), 11(5).
(For explanation of symbols see FM 21-6.)

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DESTRUCTION NOTICE

WHY — To prevent the enemy from using or salvaging this equipment for his benefit.

WHEN—When ordered by your commander.

HOW — 1. *Smash*—Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

2. *Cut*—Use axes, handaxes, machetes.

3. *Burn*—Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

4. *Explosives*—Use firearms, grenades, TNT.

5. *Disposal*—Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

USE ANYTHING IMMEDIATELY AVAILABLE FOR DESTRUCTION OF THIS EQUIPMENT.

WHAT—1. *Smash*—Meters, controls, panels.

2. *Cut*—Cables and all wiring.

3. *Burn*—Resistors, capacitors, all technical manuals, instruction books, tube charts.

4. *Bury or scatter*—Any or all of the above pieces after destroying their usefulness.

D E S T R O Y E V E R Y T H I N G

SAFETY NOTICE

WHEN THIS EQUIPMENT IS USED IN CONNECTION WITH HIGH VOLTAGES WHICH ARE DANGEROUS TO LIFE, OPERATING PERSONNEL MUST EXERCISE EXTREME CARE. SAFETY REGULATIONS AND CAUTION NOTICES WHICH APPEAR THROUGHOUT THIS MANUAL MUST BE OBSERVED AT ALL TIMES. MAKE TESTS EXACTLY AS DIRECTED. PERSONNEL NOT FAMILIAR WITH THE SERVICING OF HIGH-VOLTAGE CIRCUITS SHOULD NEVER MAKE TESTS INVOLVING SUCH CIRCUITS.

This manual supersedes War Department Training Circular 69, 19 May 1943

SECTION I

DESCRIPTION

1. PURPOSE. Test Sets I-56-C, I-56-D, I-56-H and I-56 J, referred to in this text as Test Set I-56-(*), are electrical instruments designed for the maintenance and repair of radio equipment. The purpose of this manual is to acquaint the repairman with the construction, use, and operation of the test set. Care must be exercised when handling the set since it consists of delicate electrical equipment. In the hands of the repairman who understands radio circuits and tubes, the test set affords a rapid and accurate means of locating trouble. The test set is used to analyze radio troubles; to test vacuum tubes and pilot lamps; to measure voltage, current, resistance, and audio-output voltage; and to make capacity and free-point measurements.

2. GENERAL. Test Set I-56-(*) consists of a **combination tester,** a **volt-ohm tester,** an **output meter,** accessories, and a steel carrying case (fig. 1). Model numbers of the components differ since Test Sets I-56-C and I-56-J were made by one manufacturer and Test Sets I-56-D and I-56-H by another. Test Sets I-56-C and I-56-J are practically identical. Test Sets I-56-D and I-56-H are identical. Differences are specifically explained in the text.

3. MODEL 104 COMBINATION TESTER, GENERAL. The model 104 combination tester is used for testing tubes and making measurements of a-c output, a-c and d-c voltages, direct current, resistance, and capacitance. It can also be used as a free-point tester to make voltage and current measurements at tube socket terminals of radio equipment while the power supply of the equipment is turned on. Basically, the combination tester consists of a highly-accurate 100-microampere meter which is connected into the correct test circuits by switches and jacks on the panel. The combination tester operates on 105- to 130-volt, 60-cycle alternating cur-

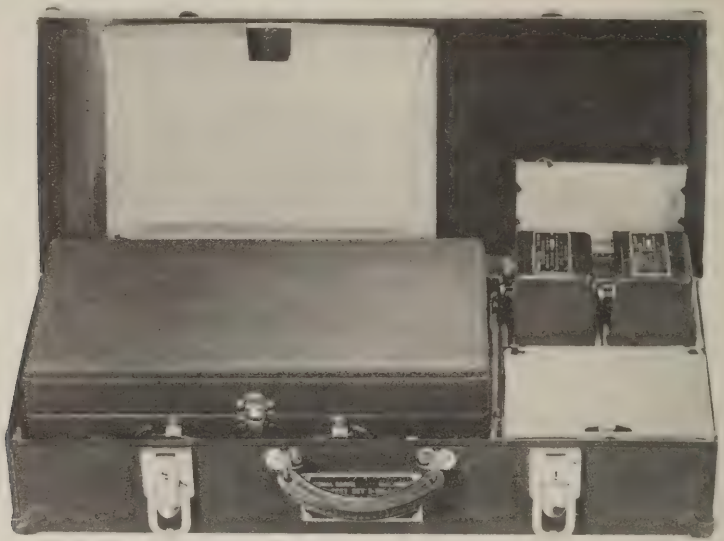

FIG. 1. TEST SET I-56-(*) WITH COVER RAISED TL-7380

rent. A model is supplied for use with 105- to 130-volt, 25-cycle alternating current. A vibrator power supply is available for supplying voltages where there is no 105- to 130-volt source. Make sure that the power cord and adapter cable are wound on the brackets in the cover and that all the panel controls are in the **off,** or neutral positions (fig. 2) before closing the cover of the tester.

4. MODEL 104 COMBINATION TESTER AS A TUBE CHECKER. The model 104 combination tester uses a standard RMA-approved emission-type tube-checking circuit. Slide switches allow testing receiver tubes, regardless of the positions of filament and cathode prongs. Individual emission tests can be made for each plate in rectifier tubes and multiple-function tubes.

a. Sockets on the tester panel serve for both Signal Corps and commercial vacuum tubes. The tester provides sockets for 4-prong, 5-prong, 6-prong, combination large and small 7-prong, 8-prong octal, 8-prong loctal, 5-prong Bantam, Jr., 7-prong miniature and 7-prong midget tubes. Pilot lamps can be tested in a special socket located in the center of the 7-prong socket. A special BN adapter for tests of acorn tubes and a lead for testing tubes with top caps are provided in the test lead compartment.

b. A neon lamp, marked SHORT TEST, visible through a hole in the panel just below the meter, indicates leakages or shorts between tube electrodes.

c. A push-button switch, marked LINE CHECK, will connect the meter so that it can be used for checking and adjusting the a-c voltage input to the combination tester.

d. A loose-leaf card-type tube chart, mounted on the upper-right corner of the tester panel, lists the switch settings for Signal Corps and commercial tubes. Index tabs aid in locating the correct card.

e. Nine single-pole 4-position slide switches, mounted below the tube chart, connect the circuits for various tests. The switches are set as directed in the tube chart. Guide lines are drawn from the tube chart to each switch.

f. Control A, also marked LINE CONTROL, located at the lower left of the panel, is used to adjust the a-c voltage supplied to the circuits within the tester.

g. Control B selects the correct circuit for the test being made or for the tube being tested.

h. Control C, also marked OHMS ADJUST, provides the correct load for the tube under test and is used in making zero adjustments on the ohmmeter.

i. Control D selects the correct filament voltage for the tube under test and serves as range selector when the unit is used as a volt-ohm-milliammeter.

5. MODEL 104 COMBINATION TESTER AS A VOLT-OHM-MILLIAMMETER. The combination tester can be used as an a-c or d-c voltmeter, a d-c milliammeter or an ohmmeter.

a. There are five d-c voltage ranges listed in a bracket marked DC at the left of control D: 10V, 50V, 250V, 500V, and 1,000V. Each range has a sensitivity of 10,000 ohms per volt, to permit connection to a fairly high resistance circuit. All d-c voltages are read on the **black** D.C. scale of the meter.

b. The five a-c voltage ranges, the same as the d-c ranges, listed in the bracket marked AC at the right of control D, have a sensitivity of 2,000 ohms per volt. All a-c voltages are read on the **red** A.C. scale of the meter.

c. The four d-c milliammeter ranges are: 1MA, 10MA, 50MA and 250MA. No provisions were made for measuring alternating current, since such measurements are rarely needed in radio maintenance work.

d. Four ohmmeter ranges permit accurate measurement of resistance values ranging approximately from 0.1 ohm to 15 megohms in the following steps: 0 to 500 ohms, 0 to 150,000 ohms, 0 to 1.5 megohms, and 0 to 15 megohms.

FIG. 2. MODEL 104 COMBINATION TESTER WITH COVER RAISED

e. The BAL position of control D may be used for continuity checks of ballast tubes with the tube tester. No instructions are given for these checks because actual ohmmeter measurements between ballast tube prongs give more useful indications.

f. Capacitor leakage-resistance measurements can be made with the highest ohmmeter range, 15MEG. Any paper or mica capacitor having a resistance of less than 10 megohms should be considered defective.

g. All ohmmeter ranges are operated by two self-contained batteries, accessible through a small removable panel in the bottom of the tester.

6. MODEL 104 COMBINATION TESTER AS A FREE-POINT TESTER (SOCKET ANALYZER).

a. When all nine slide switches (E, F, G, H, I, J, K, L, and M) of the combination tester are set in position 4, the tube sockets and the nine

TL-7382

FIG. 3. TEST SET I-56-(*), ADAPTER PLUGS

pairs of **red** and **black** jacks directly below the sockets are isolated from the rest of the tester, converting it to a free-point tester, or a socket analyzer. A free-point tester makes circuits in radio equipment accessible through the tube sockets, and eliminates the need of under-chassis socket-voltage and resistance measurements. Current measurements may also be taken without physically opening a circuit.

b. The free-point testing jacks are numbered according to the standard RMA system for tubes. A connection to a particular tube socket terminal can be made instantly by plugging a test probe into the jack with the corresponding number.

c. The seven adapter plugs, which are furnished for free-point testing, fit the following sockets: 4-prong, 5-prong, 6-prong, small 7-prong, large 7-prong, 8-prong octal and 8-prong loctal sockets. Adapter plugs for Bantam, Jr., miniature and midget tubes are not furnished. The adapter plugs are kept in the bottom of the test lead compartment as shown in fig. 3.

7. MODEL 104 COMBINATION TESTER AS USED FOR CAPACITANCE MEASUREMENTS. Capacitance values of paper and mica capacitors ranging in size from 0.001μf to 10μf can be measured with the

combination tester. The four jacks at the lower left-hand corner of the tester panel serve for capacity measurements when control B is set at CAP. The ± jack and the .1MFD jack are for capacitance ranges of 0.001μf to 0.1μf. The ± jack and the 1MFD jack are used for capacitance ranges of 0.1μf to 1μf. The ± jack and the 10MFD jack are used for capacitance ranges of 1μf to 10μf.

8. MODEL 104 COMBINATION TESTER AS AN AUDIO-FREQUENCY OUTPUT METER. The a-c voltage ranges of the combination tester can be used for measurements of a-f output voltage. The a-c voltage settings of switch D provide five different a-f output ranges, all of which will indicate a-f voltage on the a-c scale of the meter with enough accuracy for practical radio purposes. Output measurements are made with two OUTPUT jacks. A capacitor in series with the test leads keeps d-c voltages from affecting meter readings when an output measurement is being made in the plate circuit of a vacuum tube.

9. MODEL 1183-SC COMBINATION TESTER. The model 1183-SC combination tester, a component part of Test Sets I-56-C and I-56-J, is similar in use and appearance to the model 104 combination tester described above. The model 1183-SC combination tester in Test Set I-56-C differs from the model 1183-SC combination tester supplied with Test Set I-56-J. In this technical manual, model 1183-SC(J) indicates the combination tester supplied with Test Set I-56-J, and 1183-SC(C) designates the model 1183-SC combination tester in Test Set I-56-C. Both models are provided with a separate line voltage meter built into the top of the large indicating meter. The line voltage meter is used for checking and adjusting a-c line voltage. Model 1183-SC(J) differs from model 1183-SC(C) in the following ways:

a. Control B marked CIRCUIT B, has 10 positions instead of 7. The additional positions are used for capacitance measurements.

b. There are two jacks used for capacitance tests rather than four. The additional positions on control B replace two jacks.

c. The free-point test jacks are marked and mounted differently. The **red** jacks on model 1183-SC(C) correspond to the MA jacks on model 1183-SC(J), and the **black** jacks on model 1183-SC(C) correspond to the V jacks on model 1183-SC(J).

10. MODEL 102 VOLT-OHM TESTER. The model 102 volt-ohm tester, a part of Test Sets I-56-D and I-56-H, is a compact pocket-size tester which measures d-c voltage up to 1,800 volts and resistances up to 1 megohm.

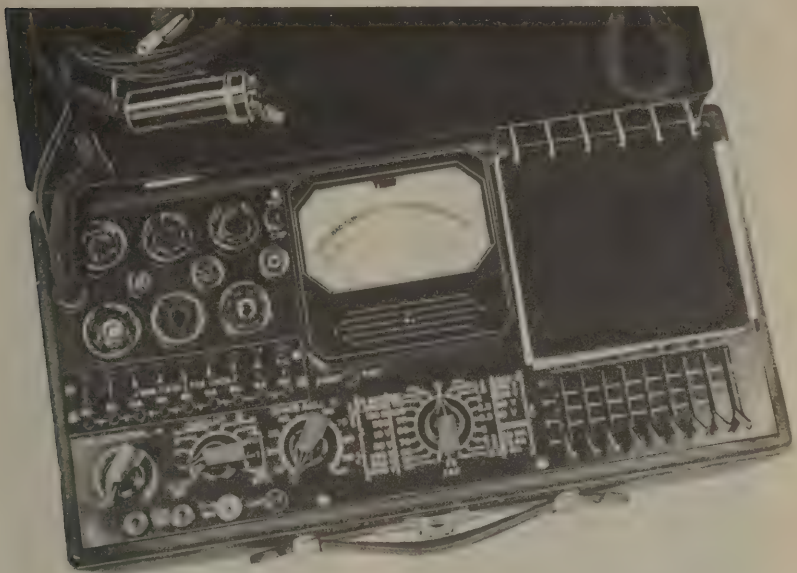

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FIG. 4. MODEL 1183-SC(J) COMBINATION TESTER

a. Five d-c voltage ranges, 3V, 30V, 300V, 600V and 1,800V, having a sensitivity of 1,000 ohms per volt, are provided.

b. There are four ohmmeter ranges employing a series-type ohmmeter circuit and a 4.5-volt internal battery. The ranges are: 0 to 1,000 ohms, 0 to 10,000 ohms, 0 to 100,000 ohms and 0 to 1,000,000 ohms (1 megohm).

c. Below the meter is a selector switch for changing ranges and under this switch is a circuit-adjusting control for the ohmmeter. In addition, there are three test lead jacks on the panel.

11. MODEL 666-SC VOLT-OHM TESTER. Model 666-SC volt-ohm tester, a part of Test Sets I-56-C and I-56-J, is similar in construction and use to model 102 volt-ohm tester (par. 10) except that the highest d-c voltage range measures up to 1,500 volts.

12. MODEL 103 OUTPUT METER. The model 103 output meter, a component of Test Set I-56-D and I-56-H, is used mainly for checking the a-f output voltage of a radio set during an alignment procedure using a signal generator. A full-wave copper-oxide rectifier in the output meter changes a-f current into a proportional direct current which moves the meter. Below the meter (on the panel) is a selector switch which selects

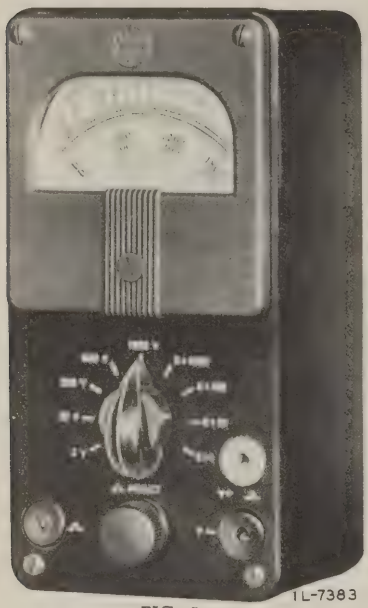

FIG. 5.
MODEL 102 VOLT-OHM TESTER

FIG. 6.
MODEL 103 OUTPUT METER

one of the five ranges for a-c and a-f voltage measurements; 1.5V, 6V, 15V, 60V and 150V. At the bottom of the panel are three jacks for test leads.

13. MODEL 650-SC OUTPUT METER. Model 650-SC output meter, a component of Test Sets I-56-C and I-56-J, is identical in design to model 103 output meter (par. 12).

14. ACCESSORY EQUIPMENT.

a. Three pairs of test leads permit each of the units to be used individually while the other units are in use.

b. Slip-on alligator clips fasten the test prods into the circuit under test.

c. A special BN adapter is provided for testing acorn tubes. The procedure is explained in paragraph 18*i*.

15. CARRYING CASE. The components of Test Set I-56-(*) fit into a steel carrying case which has four main compartments, one for each of the three test instruments and one for the test leads and adapter plugs. In addition, a flat compartment in the cover of the steel case provides a

place for the technical manual. A pad on the inside of the cover holds the two smaller instruments firmly in position when the test set is closed, and protects the instruments from damage by rough handling. Two locks, fitted with identical keys, are mounted on the front of the case.

16. COMPONENTS, WEIGHTS AND DIMENSIONS.

a. Test Sets I-56-D and I-56-H:

Quantity	Article	Dimensions (in.)			Weight (lb.)
		Height	Width	Depth	
1	Carrying case, steel, with six keys	23-9/16	8-7/8	6-3/4	17.50
1	Combination Tester, Model 104	15-1/2	7-1/2	5-1/2	17.25
1	Volt-Ohm Tester, Model 102	6-1/8	3	3-1/16	2.50
1	Output Meter, Model 103	6-1/8	3	3-1/16	1.75
1	Set of seven adapter plugs (1 each of the following: 4-prong, 5-prong, 6-prong, small 7-prong, large 7-prong, octal and loctal for free-point testing).	6-1/4	4	3/4	0.40
1	BN adapter	—	—	—	0.40
3	Pair of test leads	—	—	—	—
2	Clips, slip-on, alligator	—	—	—	0.30
1	Technical manual and/or instruction book	9	5-7/8	1/4	0.60
	Total				40.70

b. Test Sets I-56-C and I-56-J:

1	Carrying case, steel, with six keys	23-5/8	9	7	16.70
1	Combination Tester, Model 1183-SC	15	8-5/8	5-5/8	15.70
1	Volt-Ohm Tester, Model 666-SC	5-7/8	3	3	1.60
1	Output Meter, Model 650-SC	5-7/8	3	3	1.60
1	Set of seven adapter plugs (1 each of the following: 4-prong, 5-prong, 6-prong, small 7-prong, large 7-prong, octal and loctal for free-point testing).	6-1/4	4	3/4	0.40
1	BN adapter	—	—	—	0.40
3	Pair of test leads	—	—	—	—
2	Clips, slip-on, alligator	—	—	—	0.30
1	Test lead for tube tests	—	—	—	—
1	Technical manual and/or instruction book	9	5-7/8	1/4	0.60
	Total				37.30

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COMBINATION TESTER, SETTINGS

① TO MEASURE	② DIRECT VOLTAGE	③ CURRENT CURRENT	④ OHMS	⑤ ALTERNATING CURRENT VOLTAGE	⑥ CAPACITANCE	⑦ OUTPUT	⑧ FREE-POINT	⑨ TUBE TESTING
SET CONTROLS	—	—	—	—	—	—	INSERT PLUG INTO RADIO SET AS PER PARAGRAPH 24 OF BOOK	SEE DETAILED INSTRUCTIONS IN BOOK
A	—	—	—	—	METER AT 'ADJUST-LINE' POINT 'LINE CHECK' DEPRESSED	—	—	METER AT 'ADJUST-LINE' POINT 'LINE CHECK' DEPRESSED
B	SET TO V-O-MA	SET TO V-O-MA	SET TO V-O-MA	SET TO V-O-MA	SET TO CAP.	SET TO V-O-MA	SET BY COLUMN 2,3 OR 5 OF THIS CHART	SET BY TUBE CHART
C	—	—	ADJUST FOR FULL SCALE METER READING	—	—	—	—	SET TO PROPER VALUE BY TUBE CHART
D	SET TO PROPER RANGE	SET TO PROPER D.C. MA RANGE	SET TO APPROXIMATE OHMS RANGE	SET TO PROPER A.C. RANGE	SET TO 10 V. A.C. RANGE	SET TO PROPER A.C. RANGE	SET BY COLUMN 2,3 OR 5 ON THIS CHART	SET TO FILAMENT VOLTAGE BY TUBE CHART
SLIDERS	SET ALL TO POSITION NO.1	SET ALL TO POSITION NO.1	SET ALL TO POSITION NO.1	SET ALL TO POSITION NO.1	SET ALL TO POSITION NO 1	SET ALL TO POSITION NO.1	SET ALL TO POSITION NO. 4	SET BY TUBE CHART NO.1 WHERE NO. NOT SPECIFIED
TEST PRODS	V-O-MA + AND — JACKS	V-O-MA + AND — JACKS	V-O-MA + AND — JACKS	V-O-MA + AND — JACKS	IN ± AND PROPER CAP. JACK IN LOWER LEFT	OUTPUT JACKS	USE BY COLUMN 2,3 OR 5 ON THIS CHART	—
POWER	—	—	SELF CONTAINED BATTERIES	—	PLUG LINE CORD INTO POWER SOURCE	—	—	PLUG LINE CORD INTO POWER SOURCE

TL-7387

FIG. 7. COMBINATION TESTER SETTINGS

SECTION II
OPERATION

NOTE: The d-c voltage readings taken with the combination tester will often be higher than the readings given in technical manuals because the combination tester has a higher resistance (10,000 ohms per volt) than the average meter. The readings given in technical manuals are usually based upon 1,000-ohm-per-volt meters.

17. PRELIMINARY INSTRUCTIONS. Before handling any component of Test Set I-56-(*) read the instructions covering its use carefully. The components are delicate electrical instruments and must be handled with care. **Pay particular attention to all cautions;** they are inserted to guide the user and to protect the equipment. For instructions on general testing procedure see paragraph 35.

CAUTION: After completing one type of measurement, or after testing a tube, always reset all the controls to their **off** (or neutral) positions as indicated below. The practice of restoring the controls to neutral positions safeguards against damaging the instrument caused by using it before the controls have been properly set. The correct **off** (neutral) positions for the various combination tester controls are as follows (fig. 2):

Control or switch	*Name*	*Neutral position*
A	LINE CONTROL	OFF
B	Circuit switch	Position 1
C	OHMS ADJUST control	O
D	Range selector switch	OFF or D
E, F, G, H, I, J, K, L, M	Slide switches	Position 1

18. MODEL 104 COMBINATION TESTER AS A TUBE TESTER. To use the model 104 combination tester as a tube tester proceed as follows:

a. Make sure that all controls are in their neutral positions (par. 17).

b. Plug the power cord of the tester into a suitable a-c power outlet (105 to 125 volts).

c. Determine the type number of the tube to be tested by reference to the card-type tube chart. The letters G, GT, or GT/G at the end of a commercial tube number indicate the type and size of the glass envelope used on the tube. These letters are to be disregarded when looking up a tube on the tube chart. See paragraph 49 for additional tube testing data.

d. Set switch B at 1.

e. Set control C at the position specified in column C in the tube chart.

f. Set control D at the filament voltage specified in column D in the tube chart.

g. Insert the tube in the correct socket on the tester panel. **When inserting or removing a loctal tube from a socket, handle the tube as gently as possible. Tube prongs pass through the glass seals and excessive force will crack the glass.** A slight sidewise pressure applied to the tube will release the lock and permit easy removal of the tube from the socket.

h. If the tube has a top cap, insert the plug end of the tube-test lead into the jack located between the meter and the 6-prong socket and attach the rubber-covered clip to the top cap of the tube. The top cap can be left in its jack and the clip end merely set aside while testing tubes without top caps. The lead must be removed and placed in the test lead compartment before closing the cover of the tester.

i. When testing acorn tubes, plug the BN adapter into the octal socket. Then place the acorn tube in the adapter and attach the top-cap clip of the tube-test lead to the clip on the side of the adapter. If the tube has a top lead, push the adapter top-lead connector over it. The adapter top-lead connector is attached to a lead coming out of the adapter (fig. 8).

j. Turn control A (LINE CONTROL) to the right, with the LINE CHECK button depressed, until the pointer of the meter is directly over the ADJUST LINE mark.

k. Referring to the tube chart, determine which is the first slide switch (starting from E) designated with an asterisk (*), and set it at the specified position. If the neon lamp glows, the filament of the tube being tested has continuity. If the lamp does not light, the tube has an open or burned-out filament.

l. All tubes marked with a dagger (†) must be tested for "shorts" as described below. When these tubes are tested for short circuits using the

FIG. 8. COMBINATION TESTER, TESTING AN ACORN TUBE

combination tester, the voltage applied between filament and grid produces an electrostatic field which in many cases is strong enough to cause a short circuit in the tube. Remove the tube from the combination tester, and check between the tube elements using the high resistance range of the volt-ohm tester. See the proper tube base diagram in paragraph 46 to determine the correct tube prongs for the elements being tested. If a short circuit is present, the meter will deflect to full scale.

CAUTION: To avoid burning out the tube by placing 250 volts a-c between the tube elements or 30 volts a-c across the filament terminals, be sure to set all the controls for the emission test (subparagraphs *o* and *p* below) before placing the tube into the tester socket.

m. For all tubes **not** marked with a dagger (†), set the remaining asterisk-marked switches to the positions specified by the chart, leaving

all others at position 1. If the tube has a heater-type cathode, the neon lamp will indicate the amount of filament-cathode leakage. The brighter the glow, the greater the leakage. No glow from the lamp indicates negligible leakage.

CAUTION: Omit steps *m* and *n* when testing 1.4-volt "peanut" tubes with the combination tester in Test Set I-56-(*). Follow the procedure given in subparagraph *l* above for these tubes.

n. Without changing the positions of the slide switches already set, move each of the remaining switches from position 1 to position 2 to position 1, while tapping the tube lightly, and observing the neon lamp. A bright glow when any slide switch is in position 2 indicates that the tube has shorted electrodes, and should be discarded. A short momentary flash, occurring as a slide switch is being moved between positions 1 and 2, is normal, and does not indicate a short, since it is due to the charging of the capacitor in the lamp circuit.

o. If there are no shorted electrodes, proceed with the electron-emission test. Set the remaining unset slide switches at the positions specified on the tube chart. **A dash (....) on the chart means that the slide switch should be left at position 1, its neutral position.**

p. Set control B at the position specified on the tube chart.

q. Readjust Control A (LINE CONTROL) with the LINE CHECK button depressed until the pointer of the meter is directly over the ADJUST LINE mark.

r. Release the button and read the meter. If the meter registers in the **green** sector, the tube is good; if in the **red** sector, the tube is defective and should be discarded.

NOTE: Some tubes (with indirectly-heated cathodes) require heating before they will give a correct reading. Allow these tubes at least 30 seconds to heat before reading.

s. If a second or third test is required, repeat the steps described in subparagraphs *d*, *e*, *l*, *m*, *n*, *o*, *p*, and *q* above for each additional test.

t. Remove the tube, and return all controls to neutral positions.

19. MODEL 104 COMBINATION TESTER AS A PILOT LAMP TESTER. To check a pilot lamp or other type of lamp with a miniature base, set switch D to the correct voltage for the lamp. Hold the lamp in the special socket located in the center of the 7-prong socket on the tester panel.

20. MODEL 104 COMBINATION TESTER AS AN OHMMETER. To use model 104 combination tester as an ohmmeter proceed as follows:

a. Make sure that all controls are in their **off,** or neutral positions.

b. Set Control B at V-O-MA.

c. Set Control D at the resistance range required for the measurement to be made. **When in doubt, start with a higher range to prevent damage to the meter.**

d. Plug the short probe of a **red** test lead into the red V-O-MA jack at the bottom of the tester panel, and plug the short probe of a **black** test lead into the black V-O-MA jack.

CAUTION: Before making ohmmeter measurements, make sure that no voltages exist in the circuit under test. External voltages will burn out the meter.

e. If the lowest ohmmeter range (500 ohms) is used, adjust the control OHMS ADJUST (knob C) with the long-handled test probes **apart,** until the meter pointer is exactly at 0 on the HI OHMS scale (at the extreme right on the ohmmeter scale). Then, shorting the test probes by bringing their metal ends together should bring the pointer down to 0 at the left of the LO OHMS scale.

CAUTION: Never leave Control D at the **500-ohm position** any longer than necessary to get a reading, as a heavy drain is put on the battery, shortening its life.

f. If one of the higher ranges (150M, 1.5MEG or 15MEG) is used, adjust the OHMS ADJUST, Control C, with the test probes shorted, until the meter pointer is exactly at 0 on the HI OHMS scale.

g. Hold the long-handled test probes on the terminals at which the measurement is to be made. For clip-on connections, push the alligator clips over the ends of the test probes. If using the free-point tester, plug the probes into the correct **black** free-point tester jacks.

h. Read the meter indication on the correct scale for the range being used.

21. MODEL 104 COMBINATION TESTER AS A VOLTMETER. To use this instrument as a voltmeter proceed as follows:

a. Make sure that all controls are in their **off,** or neutral positions.

b. Set Control B at V-O-MA.

CAUTION: When in doubt as to voltage range to use, always start with the highest range to prevent damage to the meter.

c. Be sure that Switch D is on the proper a-c or d-c range.

d. Plug the short probe of a **red** test lead into the red V-O-MA jack on tester panel and plug the short probe of a **black** test lead into the black V-O-MA jack.

e. When taking **d-c readings**, be sure to **observe polarity. The red probe must be connected to the positive terminal and the black probe must be connected to the negative terminal** of the circuit being tested.

CAUTION: Do not touch high-voltage terminals when making measurements on radio equipment while the power is on. Any voltage over 300 volts (or less under certain conditions) is dangerous to human life. Make connections only when the equipment is turned off.

f. Read the meter indication on the correct scale for the range being used.

22. MODEL 104 COMBINATION TESTER AS A MILLIAMMETER. To use the tester as a milliammeter it is necessary to:

a. Make sure that all controls are in their **off,** or neutral positions.

b. Set Control B at V-O-MA..

c. Set Control D to the proper current range. When in doubt, start with the highest range to prevent damage to the meter.

d. Plug the short probe of a **red** test lead into the red V-O-MA jack on the tester panel and plug the short probe of a **black** lead into the black V-O-MA jack.

e. Connect the probes to the circuit, being sure to **observe polarity** (par. 21*e*).

CAUTION: For **milliammeter** measurements, the tester must always be **in series** with the circuit. Never connect a milliammeter across a voltage source or across a circuit, as any voltage over 100 millivolts will burn out the meter.

f. Read the meter indication on the correct scale for the range being used.

23. MODEL 104 COMBINATION TESTER AS AN AUDIO-FREQUENCY OUTPUT METER. To use the tester as an audio-frequency output meter:

a. Make sure that all controls are in their neutral positions.

b. Set Control B at V-O-MA.

c. Set Control D at the 50V or 10V a-c voltage positions.

d. Plug a pair of test leads into the two OUTPUT jacks.

e. Connect the test leads to the radio set terminals at which the a-f output is to be measured.

f. Turn on the radio set, and proceed with aligning adjustments while watching the meter pointer. Change Control D to lower or higher voltage ranges as required.

g. Read the a-f value on the a-c scale exactly as a-c voltages would be read.

24. MODEL 104 COMBINATION TESTER — PREPARATION FOR FREE-POINT (SOCKET ANALYZING) MEASUREMENTS. To use the tester for free-point measurements:

a. Make sure that all controls are in neutral positions.

b. Set the nine slide switches (E through M) at position 4.

c. Remove the tube from the radio set socket at which measurements are to be made and insert the tube in a corresponding socket on the panel of the tester. If the tube has a top cap, remove the tube-test lead from the test lead compartment, plug the prong end into the jack located between the meter and the 6-prong socket, and attach the rubber-covered clip to the top cap of the tube.

d. Select the adapter plug that corresponds to the base of the tube and carefully place this plug on the adapter handle. Aligning slots insure getting the adapter plug in the proper position, and a locking catch holds it in position. To release the catch, press the metal button on the side of the adapter handle. The adapter plugs are fragile and must be handled with care.

e. Insert the assembled adapter unit into the empty socket of the radio set, and push the top-cap clip for this socket, if it has one, over the button at the end of the wire coming out of the adapter handle.

f. Determine the proper tube base diagram for the tube being measured, using the chart in paragraph 47.

25. MODEL 104 COMBINATION TESTER — FREE-POINT VOLTAGE MEASUREMENTS. Free-point voltage measurements of the tube under test are made as follows:

a. **LINE CONTROL A must be in the OFF position.**

b. Set Control B at V-O-MA.

c. Set Control C at 0.

d. Set Control D at the proper voltage range.

e. Set all slide switches at position 4.

f. Choose two long leads from the test lead compartment and insert one into the **red** V-O-MA jack; the other into the **black** V-O-MA jack.

g. Insert the other ends of the leads into the correct **black** jacks. See the tube base chart and the socket connection diagram in paragraph 47 to determine the correct numbers and polarities for each measurement.

h. Read the meter indication on the correct scale for the range being used.

i. For voltage to ground measurements, measure between one of the **black** jacks and the chassis of the radio set, with the **red** (+) prod inserted in the **black** jack for all plate, screen, and cathode measurements. The black prod connects the chassis to the black V-O-MA jack.

26. MODEL 104 COMBINATION TESTER — FREE-POINT CURRENT MEASUREMENTS. The current flowing in an electrode of a tube is measured as follows:

a. Set Control D to the proper milliampere range for the tests to be made.

b. Using the **red** test lead, connect the **red** V-O-MA jack to the red jack corresponding to the electrode being measured (fig. 9).

c. Connect the **black** V-O-MA jack to the **black** jack corresponding to the tube base pin. Thus, if pin 5 of a particular tube is connected to the plate, plate current would be measured by connnecting the **red** V-O-MA jack to the **red** jack 5, and connecting the **black** V-O-MA jack to the **black** jack 5. Insertion of the test prod in the **red** jack 5 automatically opens the circuit between the red jack and its corresponding black jack, placing the meter in series with the circuit.

27. MODEL 104 COMBINATION TESTER — FREE-POINT CONTINUITY AND RESISTANCE MEASUREMENTS. Continuity and resistance measurements between electrodes of a tube are made between correspondingly numbered black jacks, the same as for voltage measurements (See figure 37 for socket connection diagram). The radio set must be turned off during these measurements.

FIG. 9. COMBINATION TESTER, FREE-POINT CURRENT MEASUREMENTS

NOTE: Current is measured between **red** and **black** jacks of the same number (fig. 9). Voltage or resistance is measured between **black** jacks or a **black** jack and the chassis.

28. MODEL 104 COMBINATION TESTER — CAPACITANCE MEASUREMENTS. When using the tester for capacitance measurements, the procedure is as follows:

a. Make sure that all controls are in neutral positions.

b. Plug the power cord of the tester into a suitable power outlet.

c. Set Control B at CAP.

d. Set Control D at any a-c voltage range.

e. Estimate the capacitance value of the capacitor being measured and plug the test leads into the ± and either the .1MFD., 1MFD. or 10MFD. jack.

CAPACITANCE VALUE CHART (in microfarads)

Meter reading on 0-10 A.C. scale	0.01 to .1μf range	0.1 to 1μf range	1 to 10μf range
1	0.011	0.10	0.55
2	.022	.21	1.10
3	.033	.31	1.70
4	.045	.41	2.30
5	.056	.51	3.00
6	.065	.61	3.80
7	.077	.71	4.70
8	.087	.81	5.75
9	.097	.95	7.20
10	—	1.00	10.00

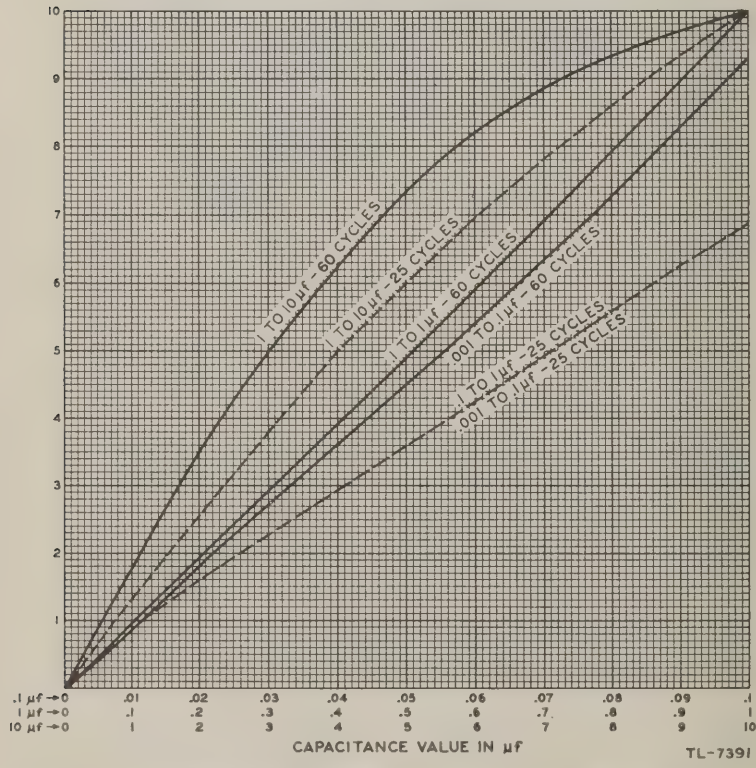

FIG. 10. COMBINATION TESTER, CAPACITANCE TEST GRAPH

CAUTION: Do not attempt to measure **electrolytic** capacitors with this tester. These instructions apply only to paper and mica capacitors.

f. Adjust Control A (LINE CONTROL) with the test button depressed until the pointer of the meter is at the center ADJUST LINE.

g. Connect the test leads to the capacitor leads. To avoid an electrical shock, do not touch these leads.

h. Read the meter indication on the 0-10 A.C. scale. Then refer to the capacitor test graph (fig. 10) to determine the capacitance value corresponding to the meter reading. The capacitance value chart lists approximate readings for 60-cycle current.

NOTE: If the resulting capacitance value indicates that greater accuracy is obtainable with a different capacitance range, repeat the operations outlined in subparagraphs *e*, *f* and *g*, above, on the new range.

i. Discharge the capacitor by shorting its terminals, when the test is completed.

29. MODEL 1183-SC COMBINATION TESTER. The operation of model 1183-SC combination tester is the same as the operation of the model 104 combination tester except for the method of measuring capacitance with the model 1183-SC(J)[1]. In model 1183-SC(J), the MA free-point jacks correspond to the **red** jacks, and the V jacks correspond to the **black** jacks on the model 104 and 1183-SC(C) combination testers. Operation instructions in paragraphs 18 through 28 will, therefore, be followed except for capacitance measurements with model 1183-SC(J) which are made as follows:

a. Make sure that all controls are in neutral positions.

b. Plug the power cord of the tester into a suitable outlet.

c. Set Control B to the .1MFD., 1MFD. or 10MFD. position, depending upon the capacity range desired. For capacities between .001 and 0.1μf use the .1MFD. position. For capacities from 0.1μf to 1μf, use the 1MFD. position, and for capacities between 1 and 10μf use the 10MFD. position.

d. Plug the test leads into the jacks marked CAP.

e. Adjust Control A (LINE CONTROL) until the pointer of the LINE VOLTS meter is at the center line.

f. Connect the test leads to the capacitor leads. To avoid electrical shock do not touch these leads.

[1] Model 1183-SC combination tester in Test Set I-56-J.

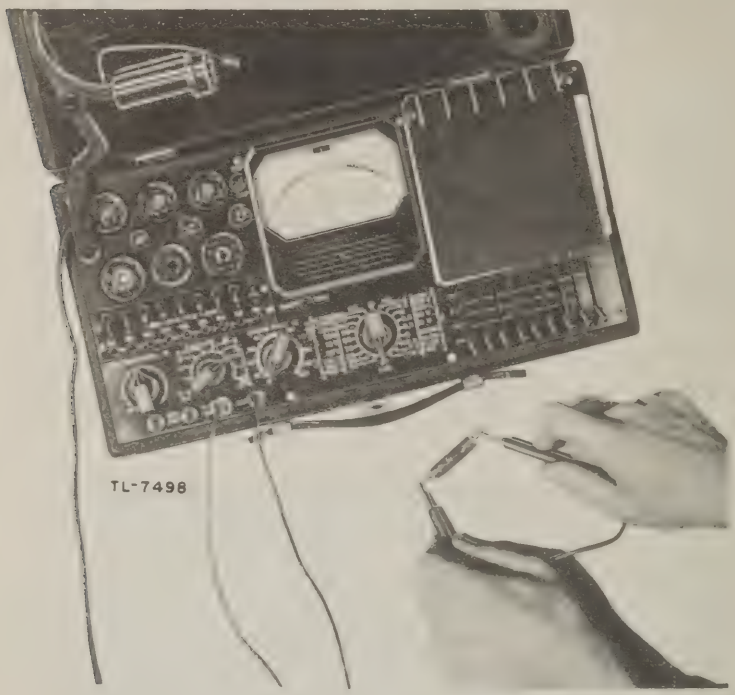

FIG. 11. MODEL 1183-SC(J) COMBINATION TESTER, MEASURING CAPACITANCE

g. Read the meter on the 0-10 A.C. scale. Refer to the capacitor test graph (fig. 10) to determine the capacitance value corresponding to the meter reading.

h. Discharge the capacitor by shorting the terminals when the test is completed.

30. MODEL 102 VOLT-OHM TESTER AS D-C VOLTMETER. To use the volt-ohm tester as a d-c voltmeter perform the following operations:

a. Set the rotary selector switch to the required voltage range for the measurement to be made. **When in doubt about the voltage, always start with the highest range.**

b. Plug the short-handled probe of the red test lead into the jack marked. V+Ω.

c. Plug the short-handled probe of the black test lead into the black jack marked V—.

CAUTION: Exercise extreme caution when dealing with high-voltage circuits, because any voltage over 300 volts (or less under certain conditions) is dangerous to human life. Make connections only when the radio set is turned off.

d. Hold the long-handled probes on the terminals at which the voltage is to be measured, with the red probe on the positive terminal. Read the meter indication on the proper scale.

31. MODEL 102 VOLT-OHM TESTER AS AN OHMMETER. When using the volt-ohm tester as an ohmmeter, the following steps are necessary:

a. Plug the short-handled probe of the black test lead into the black jack marked Ω.

b. Plug the short-handled probe of the red test lead into the red jack marked V+Ω.

c. Short the long-handled test probes by holding their metal ends together and adjust the OHMS ADJUST knob until the meter is at 0 at the extreme right graduation of the upper meter scale.

CAUTION: Before making ohmmeter measurements, be sure no voltages exist in the circuit under test. External voltages will burn out the meter.

d. Connect the long-handled test probes to the terminals at which the resistance measurement is made.

e. Read the meter indication on the upper scale. For the 1,000-ohm range (R x 1) read the resistance value directly in ohms. For the 10,000-ohm range (R x 10) multiply the reading by 10, and for the 100,000-ohm range (R x 100) multiply the reading by 100. For the 1-megohm range (R x 1,000) multiply the reading by 1,000.

32. MODEL 666-SC VOLT-OHM TESTER. Follow the instructions in paragraphs 30 and 31 for the operation of this tester.

33. MODEL 103 OUTPUT METER. To measure output of a radio set with the model 103 output meter, the following steps are performed:

a. Set the selector switch at the desired output range. When in doubt about which voltage to use, always start with the highest range.

b. Plug the red test lead into the red jack marked ±.

c. If an a-c or a-f voltage measurement is required, the circuit must be checked to see whether or not d-c voltage is present.

(1) If d-c voltage is not present (as in the voice coil of a loudspeaker or the secondary of an a-f transformer), plug the **black** test lead into the **black** jack marked VOLTS.

(2) If d-c voltage is present with the a-f output voltage, plug the **black** test lead into the **black** SERIES COND. jack.

d. Connect the test leads to the radio set terminals at which the a-f output is to be measured.

e. Turn on the radio set and proceed with aligning adjustments while observing the meter pointer. Switch to higher or lower output ranges as required.

NOTE: When taking a-c voltage readings, do not use the SERIES COND. jack if **actual voltages** are to be measured, as the impedance of the series capacitor will vary with frequency. At frequencies lower than 400 cycles the readings will be considerably less than actual values.

34. **MODEL 650-SC OUTPUT METER.** Follow the instructions in paragraph 33 for the operation of this instrument.

35. **SERVICING RADIO EQUIPMENT WITH TEST SET I-56-(*).** Before attempting to service radio equipment with Test Set I-56-(*), the repairman must be thoroughly familiar with the operation of the test set as explained in paragraphs 17 through 34 above.

NOTE: The procedure outlined in this paragraph is to be used only as a guide. Equipment must be serviced according to servicing instructions found in technical manuals dealing with the equipment.

a. Preliminary Check. A general preliminary method of servicing radio equipment is as follows:

(1) Read the instructions included with the equipment to be tested.

(2) Inspect all cables, batteries, antennas, antenna leads, grounds and ground leads, microphones, speakers and headsets for proper connections and good contacts. Look for visible mechanical or electrical defects such as shorts and soldered joints. Points at which wiring passes through metal or around the edge of the tube socket contacts are likely places for the insulation to be cut or frayed. Tube socket contact fingers should be examined to make sure they are clean and tight. See that the stator and rotor plates of the variable capacitors do not make contact.

(3) Check all fuses.

CAUTION: Many receivers and transmitters contain high voltages which are dangerous. Always turn off the equipment when making any changes or removing plugs or tubes from sockets.

(4) Remove, check and replace all vacuum tubes one at a time.

(5) Using the combination tester or volt-ohm tester, make all external continuity checks possible. Check resistance values.

(6) Make a resistance test from the high voltage lead to ground. **If the reading is zero, indicating a short, the set must not be turned on.**

b. Receiver Servicing.

(1) Using the combination tester, test all tubes in the receiver for electron emission and short circuits. Check the settings of the slide switches and the meter reading for each tube with the tube chart. To prevent replaceing tubes in the wrong socket, check one tube at a time. If a tube is defective, replace it immediately with a good tube.

(2) Check the power source.

(a) Battery Power. Put the set in as good an operating condition as possible. Turn it on and make the settings normally required to bring in a good signal. If the set has a volume control, turn it to maximum during the tests. Frequently other tests may be made with the volume control in the average working position, and a comparison of the tests may reveal a serious fault. Battery voltages should be slightly less than their rated voltage when the set is turned on. If the batteries are low, they should be charged or replaced.

(b) A-C Power. If the set is operated by alternating current, measure the line voltage to be sure that it is the voltage prescribed for the set.

(3) When making free-point tests, first be sure the receiver power is off. Remove the output tube from its socket and proceed with the free-point test (pars. 24 to 27). Check the voltages and current of tube elements. If a voltage chart is available, compare the readings with those on the chart. Voltage and current readings should be within 20 percent of chart readings, if the output stage is operating properly and the plate voltage is normal. A click should be heard in the headset or speaker when a voltmeter is connected between the cathode and control grid of the output tube.

NOTE: Make direct voltage and/or current tests rather than free-point tests whenever possible. The capacitance of the connecting cable is enough to cause detuning in r-f circuits and may cause readings obtained by the free-point method to vary from those shown in the voltage-current chart.

(4) If the output tube is a pentode with normal screen voltage but no plate voltage, the output transformer or one of its connections is faulty. If there is no screen or plate voltage, there is trouble in the power supply unit or cord. Check the dynamotor, power transformer, rectifier, vibrator, filter choke, filter capacitors, bleeder resistors and by-pass capacitors for proper operation.

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(5) Using the a-c voltmeter section of the combination tester, check the voltage at the input and secondary windings of the power transformers. Check the d-c voltage output of the rectifier, and at each stage of the filtering system, until the plate supply voltage to the output tube is reached. When using the combination tester for any voltage check, **be sure that the proper scale is selected.** The normal rated voltage of the power supply must be within the maximum voltage rating of the instrument to prevent damage to the meter or any of its multiplier resistors.

(6) When the output stage is operating properly, turn off the set, remove the analyzer plug from the output tube socket and return the tube to its socket in the set. Then select the proper adapter and check the preceding audio stage in a similar manner. Compare the readings with the voltage chart of the set. If any of the voltage readings are not normal, check each circuit element of the audio stage, and resistors and capacitors immediately connected with it.

(7) Return the audio tube to its socket and connect the analyzer plug to the detector socket. If the detector is a triode or pentode, voltage checks may be made in the same manner as the audio stage. If the detector is a diode, only filament voltage measurements can be made.

(8) A rough check of the detector may be made by switching the meter of the combination tester to a resistance range and touching two test leads to the plate and cathode of the diode. Be sure that all controls in the audio circuit are turned to maximum volume. If the audio portion of the detector circuit is operating, a loud click should be heard in phones or speaker when the connection is made.

(9) Return the detector tube to its socket. Select the proper adapter and check the voltages of each intermediate frequency stage, starting with the last and proceeding forward. When using the combination tester for voltage and current checks on intermediate frequency stages, the r-f oscillator stage, the mixer stage and the r-f amplifier stage, static voltages and current only can be measured because the capacity of the analyzer cable will detune the circuit to which it is connected.

(10) In some cases, capacity in the connecting cable may stop the oscillator from operating. Various measurements of the oscillator made under static conditions may be different from the dynamic or operating conditions. Therefore, after the i-f stages have been checked, a static or non-operating check of the oscillator and r-f stages should be made in a similar manner.

(11) If the source of trouble has not been located, check the operation of oscillator by measuring the grid current. Unsolder the grounded end of the oscillator grid leak. Using the combination tester as a milliammeter, connect it between the unsoldered wire and ground, with the positive side of the meter connected to ground. Turn the set on and read the grid current on the meter, selecting the scale that gives the highest reading on the meter

scale. On most receivers, this current is never over one milliampere. If there is no grid current or only a slight indication on the meter, the tube is not oscillating. All of the component parts of the oscillator should be checked for open or short circuits. Examine the oscillator coil for open circuits or shorted turns. Replace the defective element.

(12) With the oscillator operating properly, check the parts of each circuit of the receiver, such as the automatic volume control circuit. All resistors and capacitors connected with it should be checked for open and short circuits and for the correct values. Starting with the last i-f stage, any continuity checks possible should be made on the i-f and r-f stages to determine whether the coil, accompanying by-pass capacitors and r-f filter resistors are shorted or open or have changed value.

NOTE: If the receiver is out of alignment, the automatic volume control circuit will not function properly.

(13) If a signal generator is available, an alignment check should be made following instructions given for the receiver under test, using the output meter as an output indicator.

NOTE: The volt-ohm tester has a higher d-c voltage range than the combination tester. Use the volt-ohm tester instead of the combination tester to make d-c voltage measurements which are within its ranges.

c. Transmitter Servicing.

(1) Read the technical manual or servicing instructions on the transmitters.

(2) Check all external parts directly connected with the transmitter, such as cables and connecting plugs.

(3) Check the power supply. Be sure that the voltages are within the range of the meter used.

(4) Measure the grid current, as outlined in subparagraph *b*(11) above, to see that the oscillator is operating. The grid current will be obtained only when the tuning circuit oscillator is resonant with the crystal frequency, and will be higher than normal. If the oscillator is crystal-controlled, either check the crystal in another unit or replace it with one known to be good. Test the oscillator tube and all parts associated with the oscillator unit.

(5) Using the combination tester, test all tubes possible for emission and short circuits. If the tubes cannot be checked, replace them with good tubes of the same type.

(6) Following the instructions for the particular unit, start with the oscillator unit and check each successive r-f stage for voltages and continuity. **Be sure that the voltages to be measured are within the range of the meter used or the instrument will be burned out.**

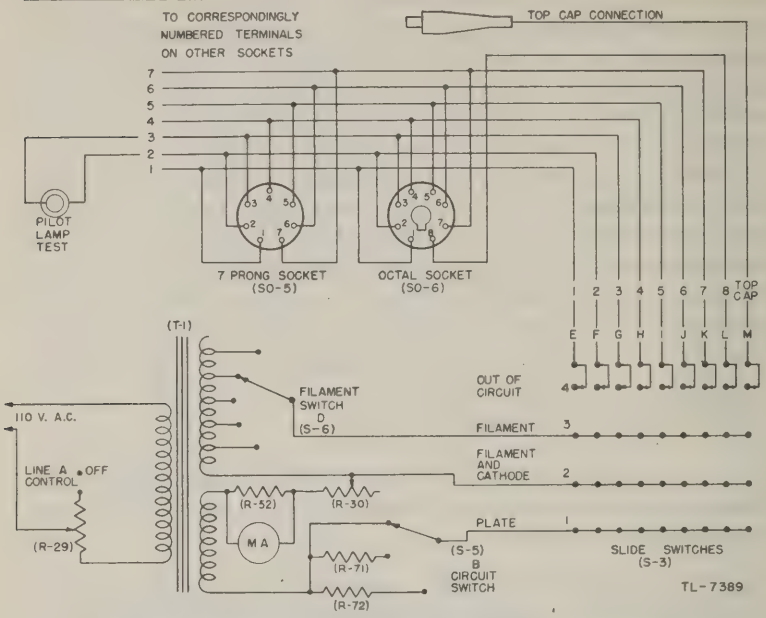


FIG. 12. MODEL 104 COMBINATION TESTER, SIMPLIFIED TUBE-TESTING CIRCUIT

(7) To test the modulator section of the transmitter, start with the audio output or modulator tube. If the voltage range of the combination tester permits, and the adapters are available for the tubes used, use the free-point tester and check voltage and current of the modulator tube. If there are no voltages, or the voltages are low, check all of the parts associated with the modulator stage and the connection to the power supply.

(8) Make the same check of each preceding stage of the modulator amplifier. Check all values of current or voltage at the available meter jacks or the built-in meters.

SECTION III
FUNCTIONING OF PARTS

36. MODEL 104 COMBINATION TESTER. Parts of the model 104 combination tester are described below as they function in the various circuits.

CAUTION: Wiring diagrams in this section are included for a better understanding of this equipment. **They must not be used for unauthorized repairs.**

a. Combination Tester as Tube Checker (fig. 12). Control A (LINE CONTROL) is a 164-ohm rheostat (R-29) which adjusts transformer (T-1) for changes in line voltage. Control B (S-5) is a 10-position 4-wafer switch used to select the proper circuit for tube tests. Control C (R-30) is a 200-ohm potentiometer which provides the proper load for the tube being tested. Control D (S-6), a 20-position 4-wafer switch, sets the proper filament voltage for the tube under test. Slide switches (S-3) are single-pole 4-position switches used to connect the tube terminals to the test circuits. Tube socket terminal 1 connects to the arm of switch E, terminal 2 to the arm of switch F, etc. The arm of switch M is connected to the top-cap clip. In position 1, the slide switch arms connect Control B and the proper load resistor to a 30-volt winding on transformer (T-1), providing the correct plate voltage for the tube being tested. In position 2, the slide switch arms connect the common leads of the two secondary windings on transformer (T-1), to the cathode of the tube being tested. In position 3, the slide switch arms connect the filament taps on the transformer (T-1) to the tube filament through control D. The emission of the tube is shown on the indicating meter. In position 4, the slide switch arms are out of the tube testing circuit. When the LINE CHECK button is pressed, a secondary winding of transformer (T-1) is connected to the type-H rectifier (RE-2), which changes the a-c to d-c voltage. The d-c voltage is then read on the indicating meter. The fila-

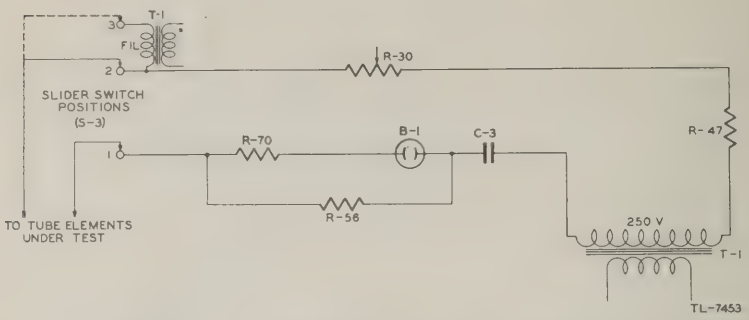


FIG. 13. MODEL 104 COMBINATION TESTER, SIMPLIFIED FILAMENT CONTINUITY AND "SHORT" TEST CIRCUIT

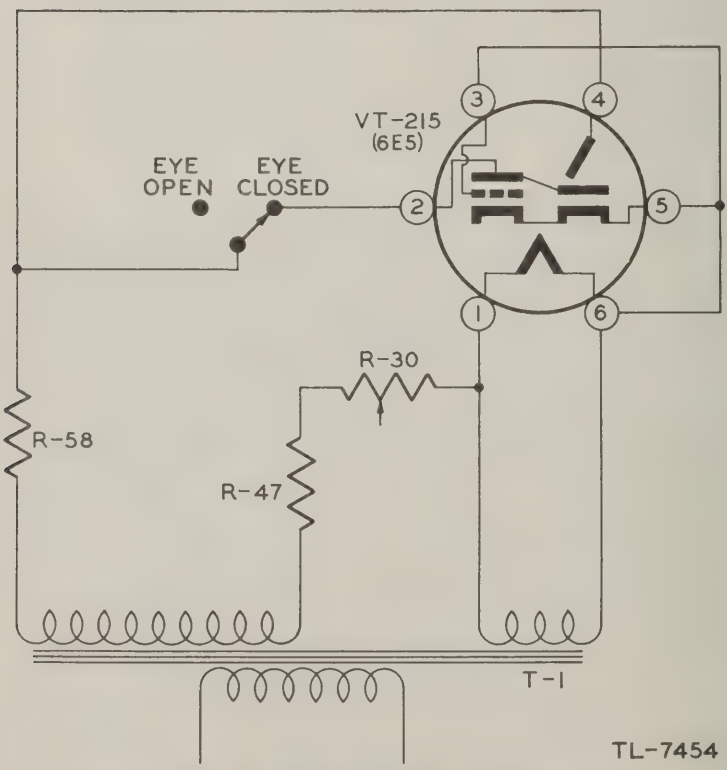


FIG. 14. MODEL 104 COMBINATION TESTER, SIMPLIFIED GLOW TEST CIRCUIT

ment continuity and "short" test circuits are identical. Figure 13 shows how a-c voltage from transformer (T-1) is placed across the tube elements under test. The neon lamp (B-1) is placed in series with the circuit. When the tube elements are "shorted" or when there is continuity, the circuit is complete and the a-c flowing in the circuit will light the neon lamp. The glow test is used to check the target of electron-ray tubes for fluorescence (fig. 14). When the "eye closed" test is applied, the target and the ray-control electrode are connected together. In the "eye open" test the ray-control electrode is disconnected from the circuit. Some tube testing charts show OP and CL in the Control C column. These letters indicate the "eye open" and "eye closed" tests as the position of Control C does not affect the glow test circuit.

b. Combination Tester as A-C Voltmeter (fig. 15). When **Control D** is set at any a-c voltage range the proper multiplier resistors are put in series with the rectifier. The type-H rectifier changes the alternating current to direct current so the d-c meter (M-3) can indicate the voltage applied to the rectifier through the multiplier resistors.

c. Combination Tester as D-C Voltmeter (fig. 16). With **Control D** set at any d-c voltage range, the correct multiplier resistors are placed in series with the indicating meter.

d. Combination Tester as D-C Milliammeter (fig. 17). Control D inserts the correct shunt resistor in parallel with the indicating meter, so that for each milliampere scale the proper resistor is in the circuit.

e. Combination Tester as a Capacitance Measuring Device (fig. 18). When Control D is set at CAP, the circuits are so arranged that either the 1.5-, 7.5- or 70-volt winding of transformer (T-1) is placed in series with the capacitor being tested. Resistors (R-50) and (R-30) are shunted across the rectifier input. One terminal of the capacitor under test is connected to an input terminal of the rectifier. The other input terminal of the rectifier is attached to resistor (R-30). The indicating meter is placed across the output terminals of the rectifier. The meter is read on the 10-volt a-c scale. This reading is used with the capacitance graph (fig. 10) to determine the capacity of the capacitor under test.

f. Combination Tester as A-F Output Meter. The various parts function the same as in the a-c voltage tests. However, for a-f voltage measurements, capacitor (C-2) is placed in series with the OUTPUT jack as shown by the dotted lines in figure 15.

g. Combination Tester as Ohmmeter (fig. 19). Control D arranges the circuits so that for each of the four resistance ranges, the proper multiplier and shunt resistances are inserted. Battery BA-30 (1-1/2-volt) sup-

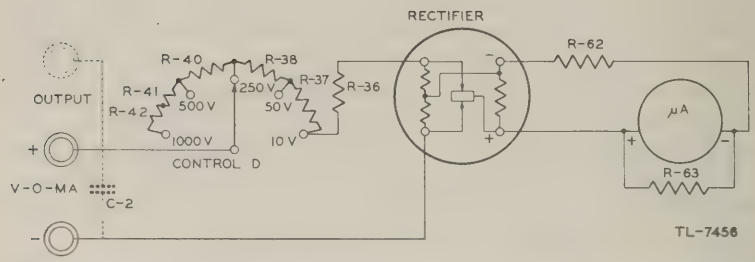


FIG. 15. MODEL 104 COMBINATION TESTER, SIMPLIFIED A-F AND A-C VOLTMETER CIRCUIT

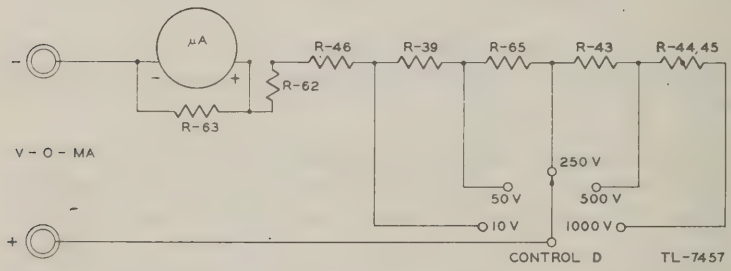


FIG. 16. MODEL 104 COMBINATION TESTER, SIMPLIFIED D-C VOLTMETER CIRCUIT

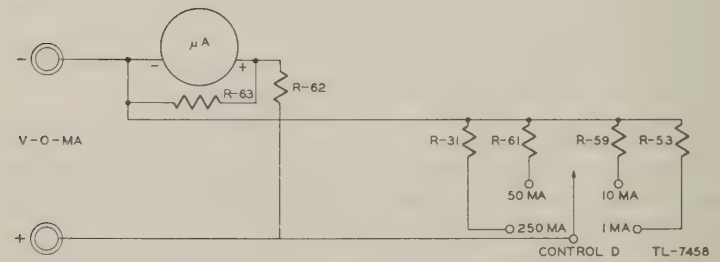


FIG. 17. MODEL 104 COMBINATION TESTER, SIMPLIFIED D-C MILLIAMETER CIRCUIT

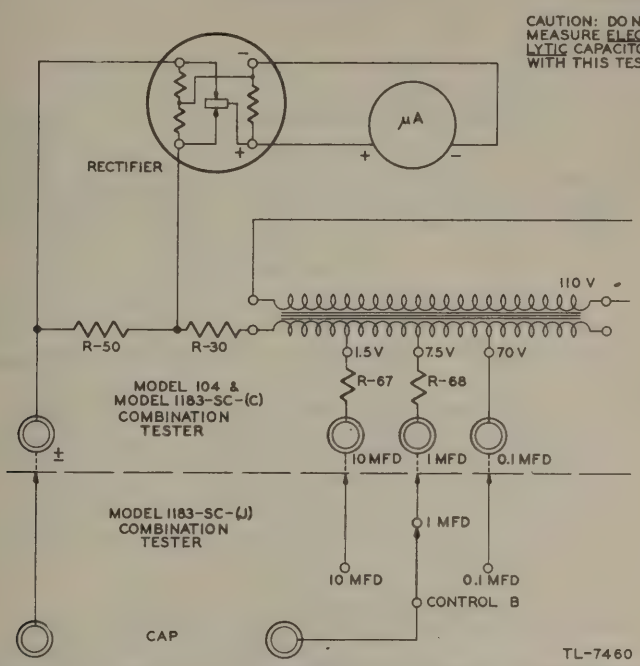


FIG. 18. MODEL 10' COMBINATION TESTER, SIMPLIFIED CAPACITANCE MEASURING CIRCUIT

plies current for the 500-ohm and 150,000-ohm ranges. Battery BA-2 (22-1/2-volt) furnishes current for the 1.5-megohm and 15-megohm ranges.

h. Combination Tester as Free-Point Tester (fig. 20). When all the slide switches (S-3) are in position 4, the tube socket terminals are connected to the red (MA) and black (V) jacks (J-5, J-6). The free-point cable (CAB-1) is connected to the red (MA) jacks (J-5). The number on the jacks and adapter plugs correspond to the tube socket numbers, so that terminal 1 on the tube socket terminal is connected to jack 1 and adapter plug prong 1. Measurements can be made between the various jacks in the same manner as for external circuits.

37. MODEL 1183-SC COMBINATION TESTER. This unit functions the same as the model 104 combination tester (par. 36) with the following exceptions:

a. The LINE VOLTS meter in model 1183-SC has an a-c movement, and is placed directly across the 30-volt secondary of transformer (T-1), eliminating the need for a rectifier in this circuit.

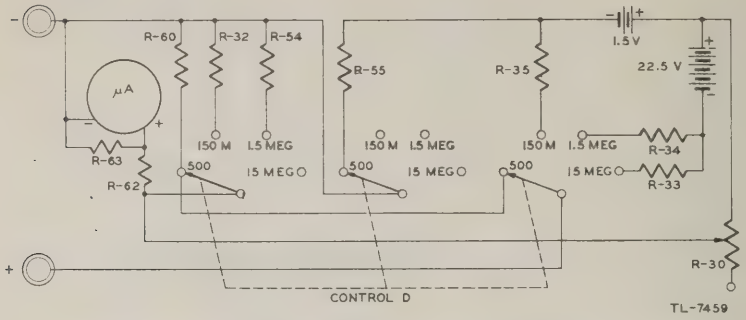


FIG. 19. MODEL 104 COMBINATION TESTER, SIMPLIFIED OHMMETER CIRCUIT

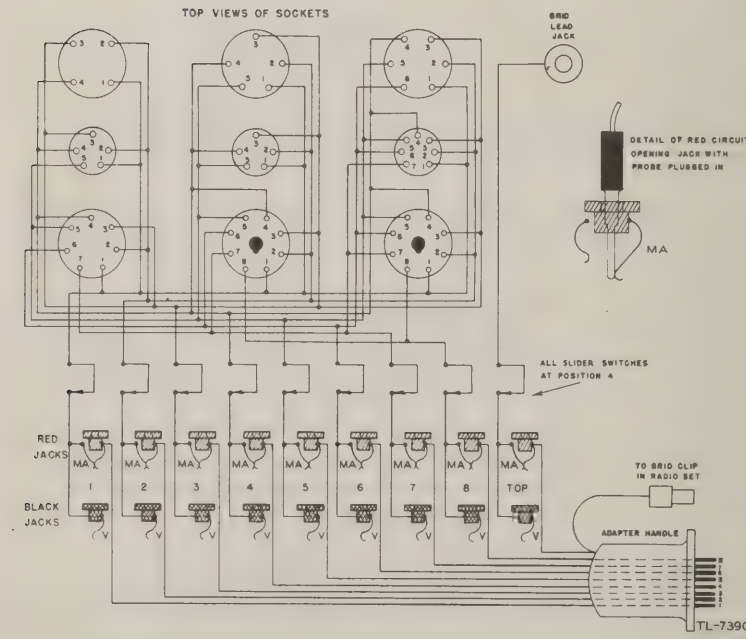


FIG. 20. MODEL 104 COMBINATION TESTER, SIMPLIFIED FREE-POINT TESTING CIRCUIT

b. Model 1183-SC(J) has three additional positions on Control B for capacitance measurements which eliminate three capacitance jacks (J-7).

38. MODEL 102 VOLT-OHM TESTER. Selector switch (S-1) places the correct shunt and multiplier resistors for the resistance or voltage range being used (fig. 29). The OHMS ADJ. control (R-1) adjusts the current flowing through meter (M-1) so the pointer can be "zeroed" at the full scale reading on the **OHMS** scale. Battery BA-31 (4.5-volt) furnishes current for the resistance measurements.

39. MODEL 666-SC VOLT-OHM TESTER. The model 666-SC volt-ohm tester functions the same as the model 102 volt-ohm tester (par. 38).

40. MODEL 103 OUTPUT METER. Selector switch (S-2) connects the various shunt and multiplier resistors for the range being used (fig. 32). The rectifier (RE-1) converts a-c voltage into the d-c voltage which moves the meter pointer. The SERIES COND. jack places capacitor (C-1) in series with the circuit to keep high d-c voltage out of the rectifier and meter.

41. MODEL 650-SC OUTPUT METER. This meter functions the same as the model 103 output meter (par. 40).

SECTION IV
MAINTENANCE

UNSATISFACTORY PERFORMANCE OF THIS EQUIPMENT WILL BE REPORTED IMMEDIATELY ON W. D., A. G. O. FORM NO. 468. IF THIS IS NOT AVAILABLE, SEE TM 38-250.

42. GENERAL. Combination testers, model 104 and model 1183-SC, and volt-ohm testers, model 102 and model 666-SC, are equipped with self-contained batteries and type-H plug-in rectifiers which may require replacement. This section covers only necessary tube chart, battery and rectifier replacements.

CAUTION: Test set panels must be opened only to make necessary battery and rectifier replacements. No other service work should be done on these instruments at any time, except by authorized Signal Corps repair shops or by the manufacturer.

43. COMBINATION TESTERS, MODEL 104 AND MODEL 1183-SC.

a. General. Batteries and type-H plug-in rectifiers which require replacement in these instruments can be reached by removing a small panel fastened to the bottom of the case with four screws.

b. Battery Replacement. Instructions for replacing batteries are printed on the panel (fig. 21). As the batteries drop in potential because of use or age, the OHMS ADJUST. control must be turned closer to 100 for a zero adjustment. When the meter pointer cannot be brought to 0 on the upper scale of the ohmmeter with the test leads shorted together (on any one of the ohmmeter ranges), the battery serving that range should be replaced. Do not replace batteries until the battery clips have been inspected. A poor battery connection may give the same indication as a bad battery. Batteries are replaced as follows:

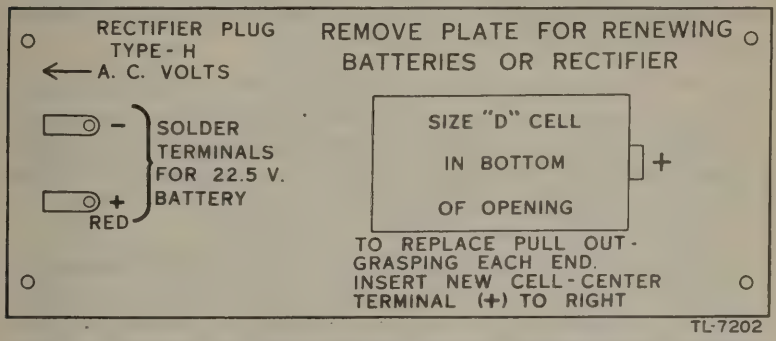


FIG. 21. MODEL 104 AND MODEL 1183-SC COMBINATION TESTER, BATTERY REPLACEMENT PANEL

(1) A single Battery BA-30 (1-1/2-volt), set between the spring brass terminals, furnishes current for the 500-ohm and the 150,000-ohm ranges. Replace by pulling out the old battery and pushing in a new one.

(2) A 22-1/2-volt Battery BA-2, which clamps to the back of the removable panel, furnishes current for the two higher ohmmeter ranges. To replace this battery remove the four screws on the panel beneath the tester, lift out the panel carefully, loosen or remove the two screws in the battery strap, and remove the old battery. Then unsolder the battery leads from the terminal strip, and solder the leads of the new battery in place. Seat the new battery and tighten the battery strap and replace the panel.

NOTE: If replacement of the batteries does not restore correct operation or if the tester does not function properly on any of its other ranges, the tester should be turned in as defective. Do not attempt to repair the tester, as considerable damage may be done to it.

c. Rectifier Replacement. To replace the rectifiers proceed as follows:

(1) Remove the battery panel to reach the plug-in rectifier units. If the a-c voltage ranges, the output ranges and the capacitance-testing ranges fail to operate properly, but the other ranges are satisfactory, replacement of the rectifier unit will usually clear the trouble. Pull out the old rectifier unit and plug the new one into the rectifier socket. A standard 4-prong socket makes it impossible to insert the rectifier incorrectly.

(2) Combination tester, model 104, has in addition a type-H plug-in rectifier used for line tests, which is the rectifier nearer the outside edge of the tester. Replace the rectifier when the line test cannot be made properly. The line-test rectifier may be used to replace a defective meter-circuit rectifier, but the replacement should be made only when the ac-

curacy of the tube testing function of the combination tester is unimportant compared to its use as a general purpose a-c meter.

d. Tube Chart Replacement. Tube chart cards on the combination tester in Test Sets I-56-C, I-56-D and I-56-H may be replaced by opening the binding rings. Before removing or replacing cards, on the combination tester in Test Set I-56-J, one screw in the upright bracket must be removed, and the bracket swung back.

44. VOLT-OHM TESTERS, MODEL 102 AND MODEL 666-SC. Each volt-ohm tester contains a 4.5-volt Battery BA-31 which supplies current for the ohmmeter ranges. As the battery drops in potential due to use or age, the Ω ADJUST control must be turned more to the right each time the instrument is used. When the meter pointer cannot be brought to 0 on the ohmmeter scale by adjusting the Ω ADJUST control, the battery should be replaced. Replace batteries as follows:

a. Remove the screws at the four corners of the instrument panel. (Two of these screws pass through the upper corners of the meter housing.) Then lift the entire instrument panel and battery out of the plastic case.

b. Disconnect the old battery from the circuit by removing the knurled terminal nuts on the battery studs, or unsolder the connections if necessary. Remove the battery from the holding clamps and place a new battery into position. Connect the new battery. The **red** lead must go to the positive (+) terminal, and the **black** lead must be connected to the negative (—) terminal. Replace the panel assembly in the case, making sure that the name plate is at the jack end of the panel, before replacing the panel screws.

NOTE: If replacement of the battery does not restore normal operation, or if the tester does not function properly, the test set must be turned in as defective.

45. OUTPUT METERS, MODEL 103 AND MODEL 650-SC. The output meters do not contain batteries or fuses, and should be opened only at an authorized Signal Corps repair shop. If the instrument does not function properly, it must be turned in as defective. Diagrams and drawings in the text are for use only by authorized repair personnel. These test instruments are very delicate and require special repair equipment. Replacement of parts will affect the calibration of the meters.

NOTE: The glass in some of the meters is so thick that it often binds the pointer. Authorized repair personnel must check to see that glass replacements do not interfere with the movement of the meter pointer.

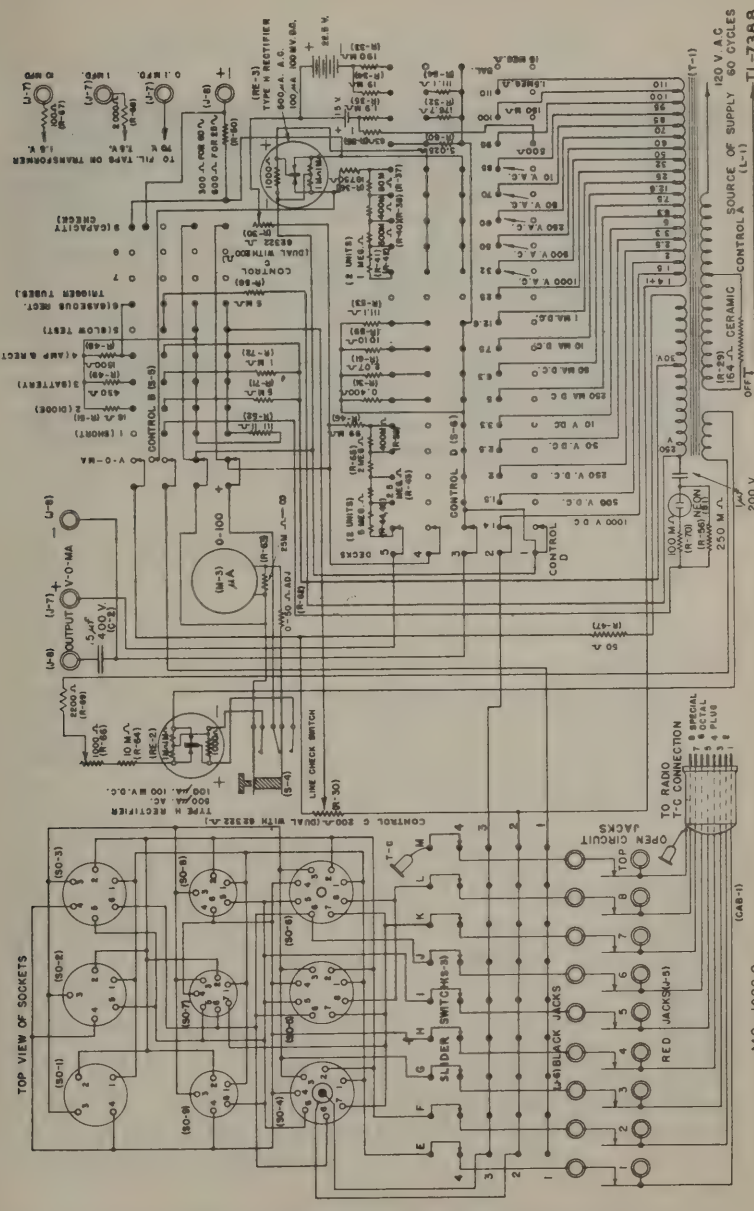


FIG. 22. MODEL 104 COMBINATION TESTER, SCHEMATIC DIAGRAM

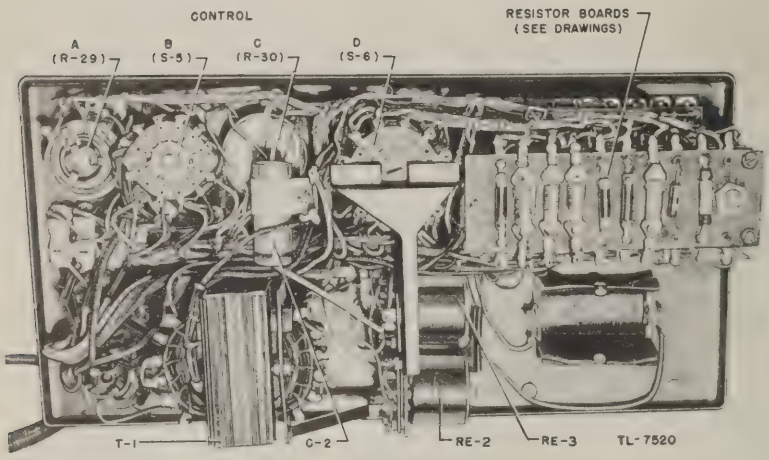


FIG. 23. MODEL 104 COMBINATION TESTER, BOTTOM VIEW OF CHASSIS.

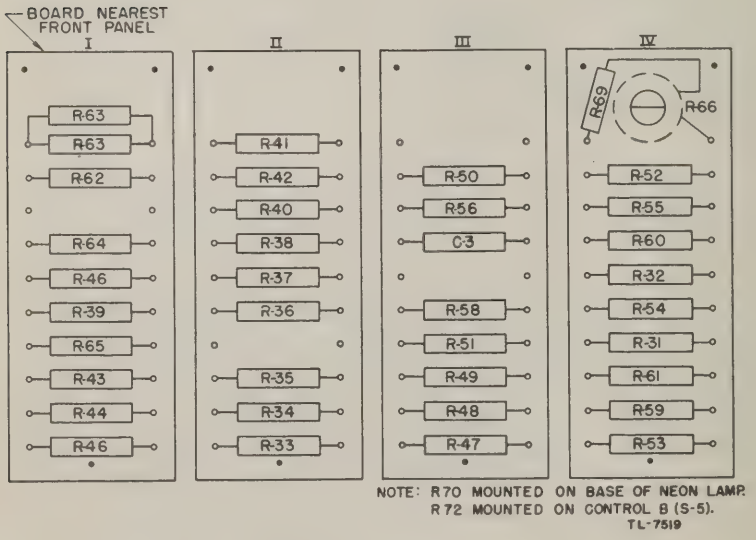


FIG. 24. MODEL 104 COMBINATION TESTER, RESISTOR BOARD DIAGRAM

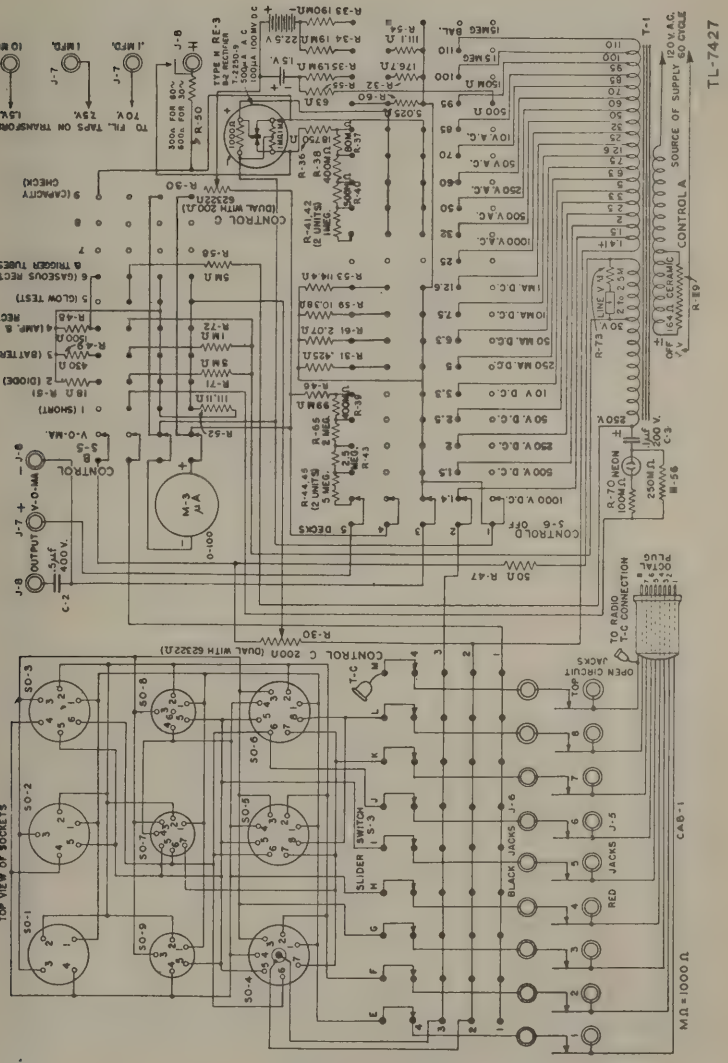


FIG. 25. MODEL 1183-SC(C) COMBINATION TESTER, SCHEMATIC DIAGRAM

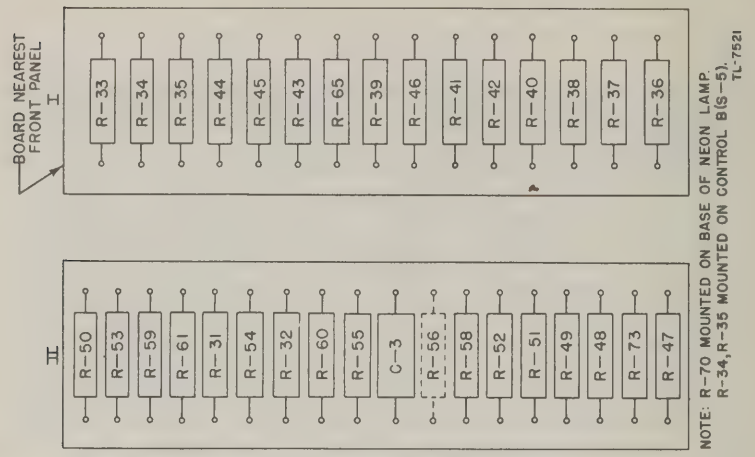


FIG. 26. MODEL 1183-SC(C) COMBINATION TESTER, RESISTOR BOARD DIAGRAM

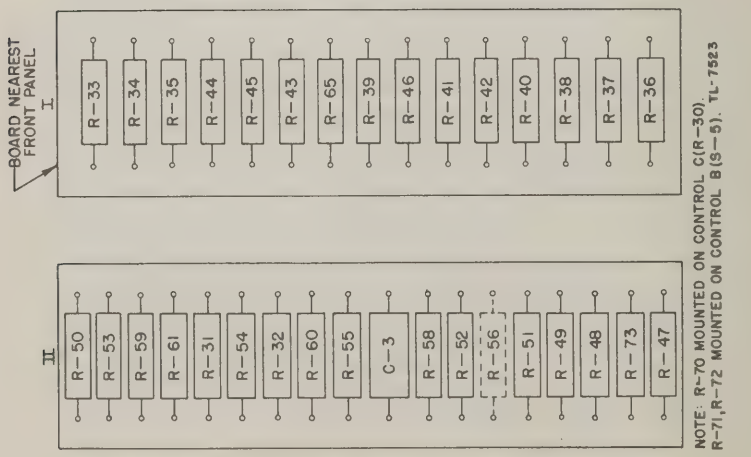
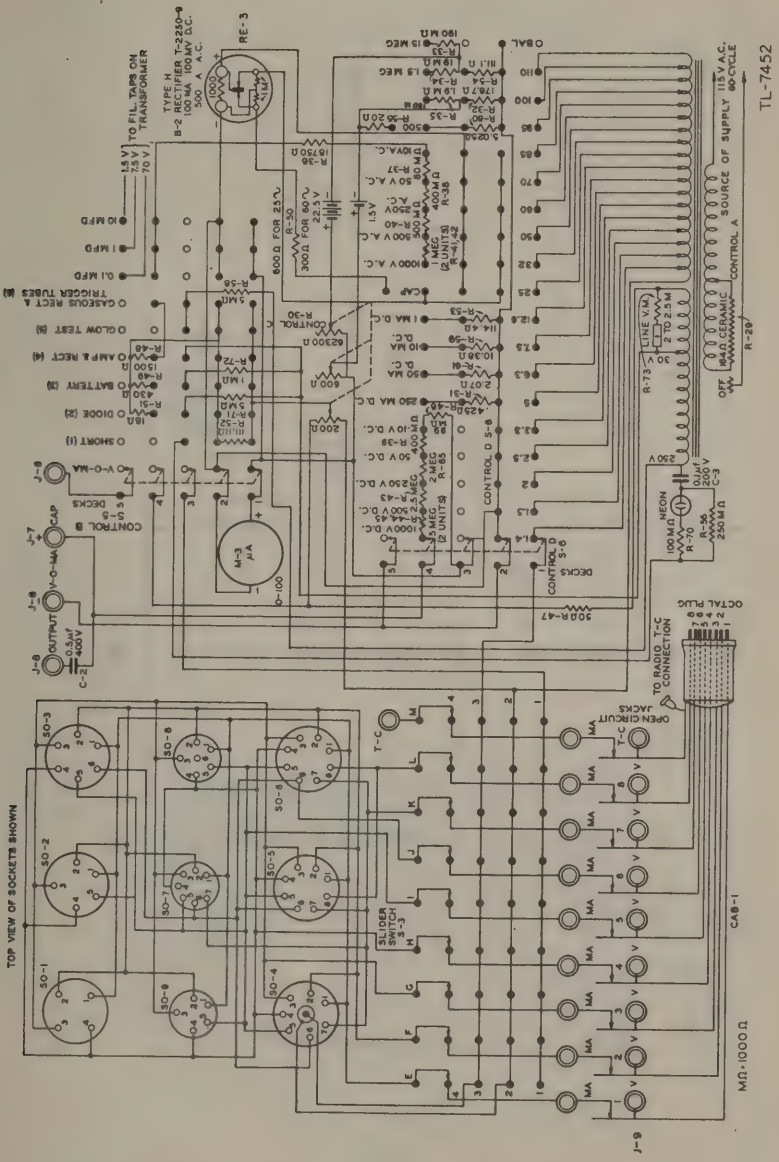


FIG. 27. MODEL 1183-SC(J) COMBINATION TESTER, RESISTOR BOARD DIAGRAM


TL-7452
TYPE H
B-2 RECTIFIER T-2250-9
100 MA 100 MV D.C.
500 A A.C.
RE-3
TO FIL. TAPS ON TRANSFORMER
15 V
7.5 V
70 V
10 MFD
1 MFD
0.1 MFD
CASEOUS RECT A
TRIGGER TUBES (8)
GLOW TEST (5)
AMP A RECT (4)
BATTERY (3)
DIODE (2)
SHORT (1)
J-1
J-7
J-8
J-9
V-O-MA
OUTPUT
0.5 MF
400 V
C-2
CONTROL B
S-5
DECKS
CAP
M-1
1 MA
0-100
CONTROL
62300 Ω
R-30
600 Ω FOR 25 V
300 Ω FOR 50 V
R-50
22.5 V
1.5 V
CONTROL D
S-6
DECKS
OHMS
180 MEG
15 MEG
1.5 MEG
150 K
15 K
1.5 K
150 Ω
15 Ω
1.5 Ω
R-33
R-34
R-35
R-36
R-37
R-38
R-39
R-40
R-41
R-42
R-43
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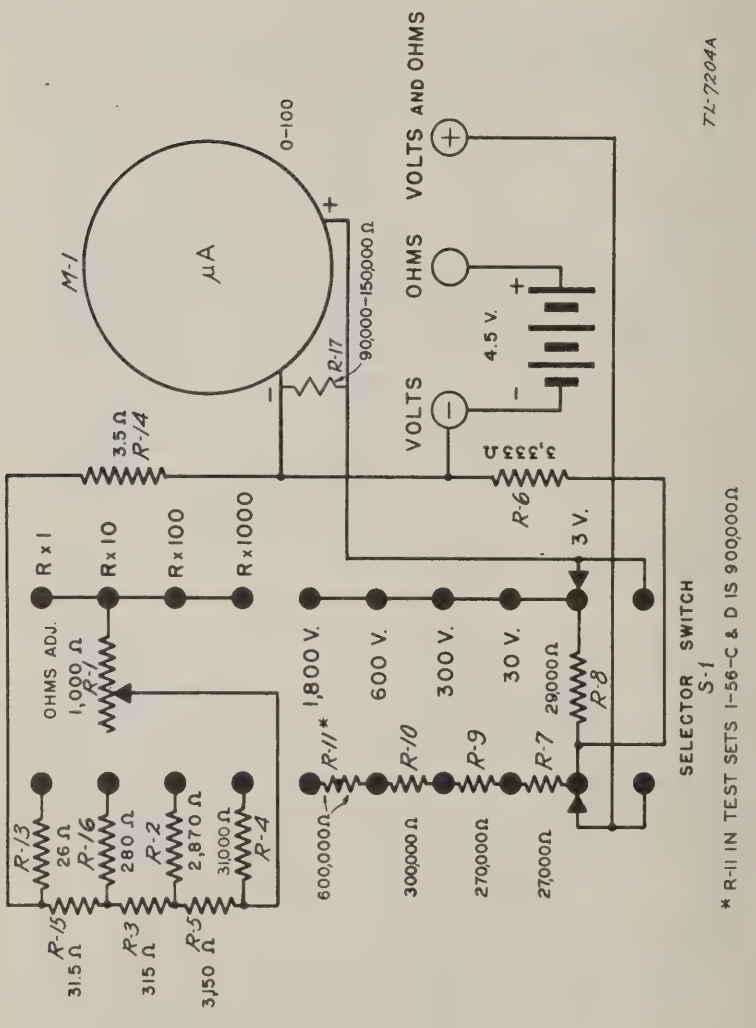

FIG. 29. MODEL 102 AND MODEL 666-SC VOLT OHM TESTER, SCHEMATIC DIAGRAM

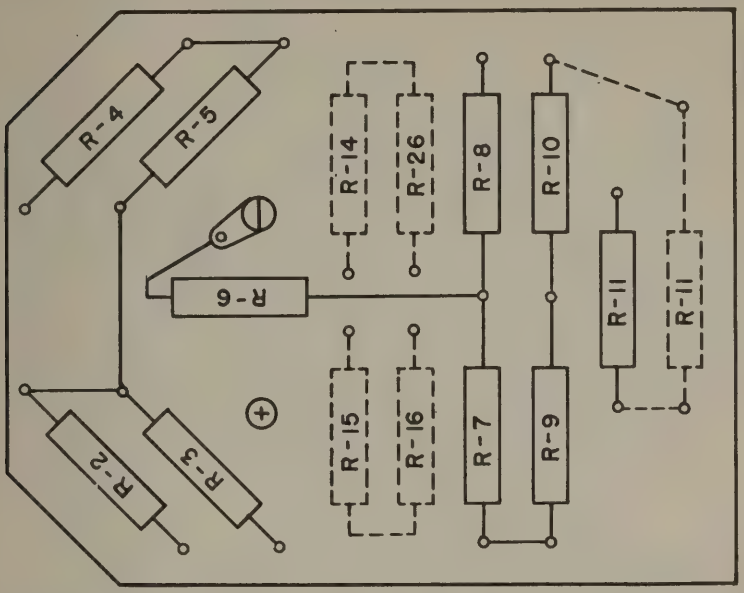

FIG. 30. MODEL 102 VOLT-OHM TESTER, RESISTOR BOARD DIAGRAM

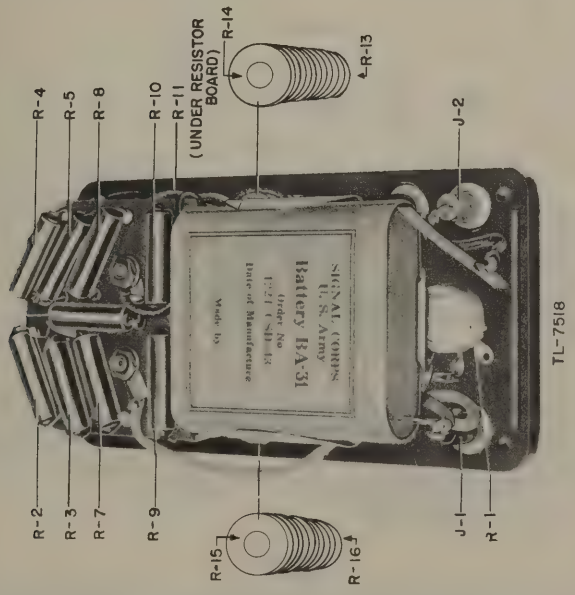

FIG. 31. MODEL 666-SC VOLT-OHM TESTER, LOCATION OF PARTS

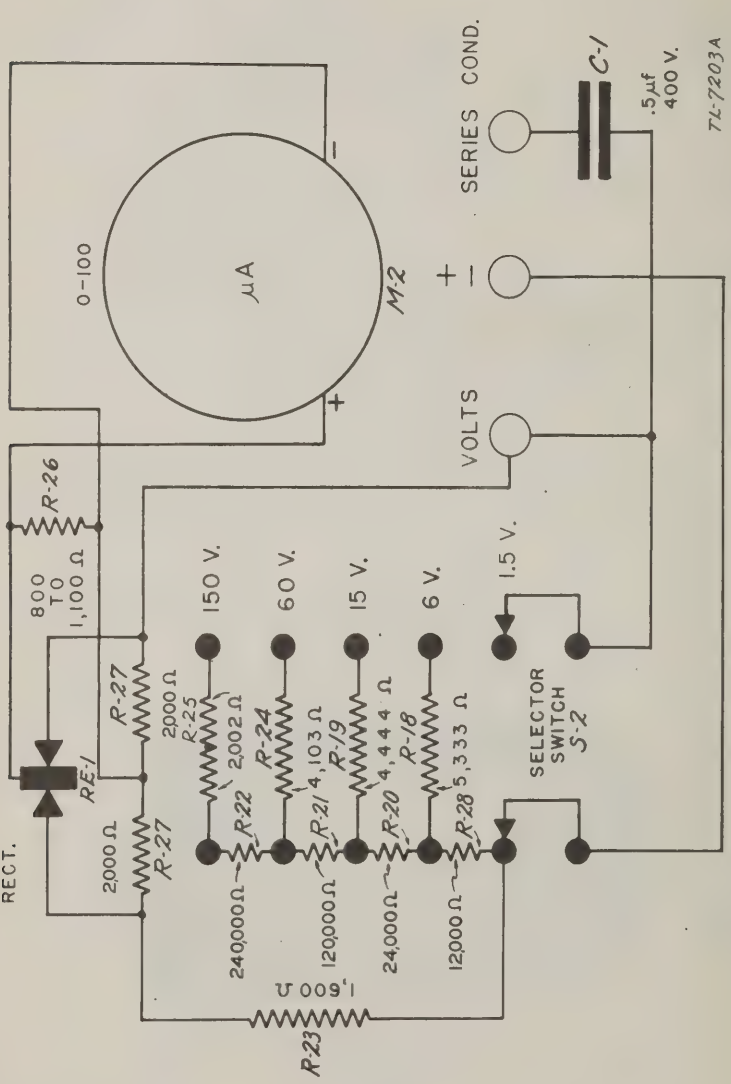

FIG. 32. MODEL 103 AND MODEL 650-SC OUTPUT METER, SCHEMATIC DIAGRAM

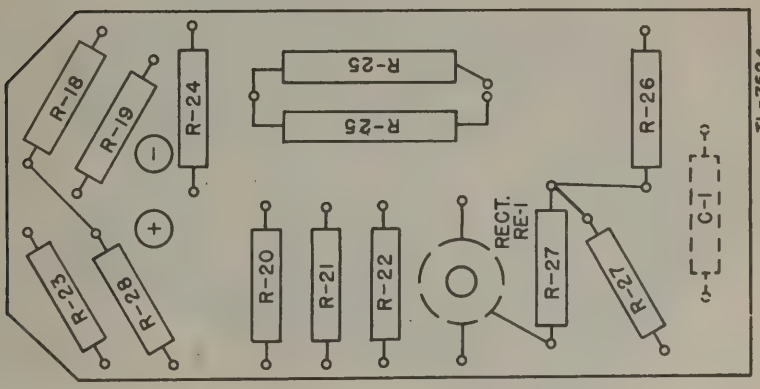

FIG. 33. MODEL 103 OUTPUT METER, RESISTOR BOARD

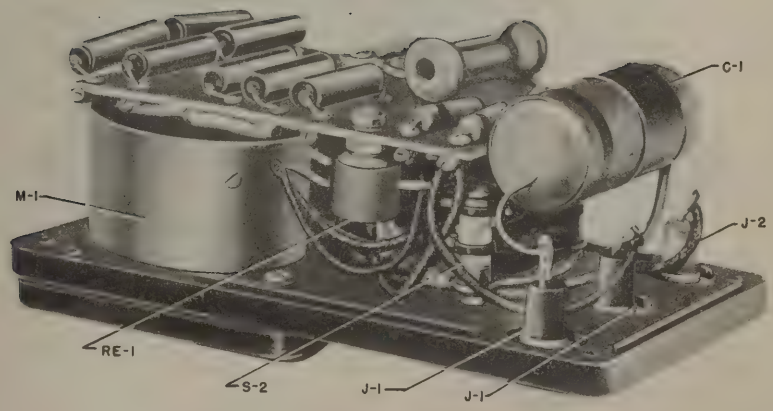

FIG. 34. MODEL 650-SC OUTPUT METER, LOCATION OF PARTS

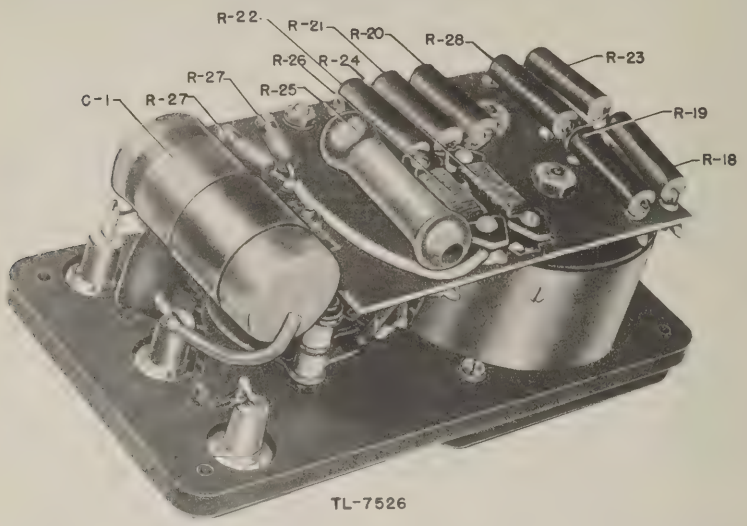

FIG. 35. MODEL 650-SC(C) OUTPUT METER, RESISTOR BOARD

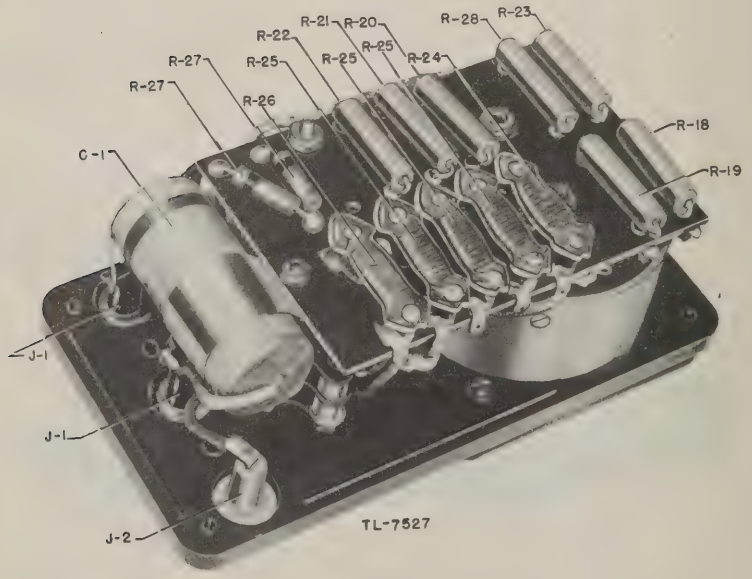

FIG. 36. MODEL 650-SC(J) OUTPUT METER, RESISTOR BOARD

46. MOISTUREPROOFING & FUNGIPROOFING INSTRUCTIONS.

a. General. The moistureproofing and fungiproofing instructions for components of Test Set I-56-(*) given below supplement general instructions supplied with moistureproofing and fungiproofing equipment.

b. Preliminary steps. Before any components of Test Set I-56-(*) can be moistureproofed and fungiproofed, the instrument must be checked for proper operation. Defective equipment must be repaired by authorized personnel before proceeding. Then prepare the instruments as follows:

(1) COMBINATION TESTERS, MODEL 104 AND MODEL 1183-SC. Loosen the four screws on the bottom of the panel and remove the panel, batteries, and rectifier unit. Carefully disconnect the leads from the meter terminals, and, after taking out the four screws holding the meter remove the meter from the panel.

(2) VOLT-OHM TESTERS, MODEL 102 AND MODEL 666-SC, AND OUTPUT METERS, MODEL 103 AND MODEL 650-SC. Loosen the four screws holding the meter panel and remove the unit from the case. Take out the battery and disconnect the leads attached to the meter contacts. Lift up the terminal board carefully so that no leads are broken. Loosen the screws holding the meter and remove the meter from the panel.

c. Procedure.

(1) Moistureproof and fungiproof the equipment as follows: Place the panel and attached parts in the baking oven. DO NOT EXCEED 160° F. If there are indications of melting wax, reduce the temperature. The total baking time must be increased one hour for each 10° F. drop in temperature.

(2) When the baking is finished, remove the unit from the oven and brush varnish on all exposed surfaces except the rotary-switch contacts.

CAUTION: Protect switch contacts from the varnish.

(3) After the varnish has dried properly, mount the meter on the panel.

(4) Brush varnish around the inside of the case and panel. Do not allow any varnish to touch the rotary-switch contacts.

(5) When the varnish has dried, reassemble the parts.

(6) Check the equipment to see that it operates properly.

SECTION V
SUPPLEMENTARY DATA

47. TUBE-BASE CHART FOR SIGNAL CORPS AND COMMERCIAL TUBES.

a. Signal Corps Tubes. (See tube-base connection diagrams in Fig. 37.)

Tube	Base	Tube	Base	Tube	Base
VT-7	4D	VT-56	5A	VT-89	6F
VT-24	4D	VT-57	6F	VT-90	7Q
VT-25	4D	VT-58	6F	VT-91	7R
VT-25-A	4D	VT-62	4D	VT-91-A	7R
VT-26	4K	VT-63	5C	VT-92	7V
VT-27	4D	VT-65	6Q	VT-92-A	7V
VT-28	5E	VT-66	7S	VT-93	8E
VT-29	5A	VT-67	4D	VT-94	6Q
VT-30	4D	VT-68	7D	VT-94-A	6Q
VT-31	4D	VT-69	6F	VT-94-D	6Q
VT-33	5K	VT-70	7E	VT-95	4D
VT-35	5E	VT-72	4D	VT-96	8B
VT-36	5E	VT-73	5A	VT-97	5T
VT-37	5A	VT-74	5L	VT-98	6R
VT-38	5F	VT-75	6G	VT-99	8G
VT-40	4D	VT-76	5A	VT-100	5AW
VT-41	4K	VT-77	6F	VT-101	6BM
VT-44	4K	VT-78	6F	VT-103	8Q
VT-45	4D	VT-80	4C	VT-104	8Q
VT-46	4P	VT-83	4C	VT-105	8S
VT-46-A	4P	VT-84	5D	VT-107	7AC
VT-47	5B	VT-86	7R	VT-107-A	7AC
VT-48	6B	VT-86-A	7R	VT-107-B	7AC
VT-49	5F	VT-86-B	7R	VT-112	8N
VT-50	4D	VT-87	7T	VT-114	5T
VT-51	4D	VT-87-A	7T	VT-115	7AC
VT-52	4D	VT-88	7V	VT-115-A	7AC
VT-54	4M	VT-88-A	7V	VT-116	8N

Tube	Base	Tube	Base	Tube	Base
VT-116-B	8N	VT-169	8E	VT-206-A	5L
VT-117	8N	VT-170	5Y	VT-207	8BE
VT-119	4AB	VT-171	7AT	VT-208	8X
VT-120	5BB	VT-171-A	7AT	VT-209	8BC
VT-121	5BC	VT-172	6AU	VT-210	7AV
VT-124	6X	VT-173	6AR	VT-211	8BC
VT-125	6X	VT-174	7BA	VT-212	5BD
VT-126	6S	VT-175	7S	VT-213-A	6Q
VT-126-A	6S	VT-176	8N	VT-214	7Q
VT-126-B	6S	VT-177	5AG	VT-215	6R
VT-131	8N	VT-178	7AK	VT-216	4P
VT-132	8K	VT-179	7AO	VT-221	7AP
VT-133	8Q	VT-180	6BB	VT-223	5Z
VT-134	7AC	VT-181	5AB	VT-224	7BL
VT-135	6Q	VT-182	7BE	VT-225	5J
VT-135-A	6Q	VT-183	4AH	VT-227	6BO
VT-136	5AZ	VT-184	4AJ	VT-229	8BD
VT-137	6Q	VT-185	6BB	VT-231	8BD
VT-138	7AL	VT-188	8W	VT-233	8Q
VT-139	4AJ	VT-189	8AC	VT-234	2T
VT-145	4C	VT-190	8V	VT-235	3P
VT-146	5Y	VT-192	5AC	VT-237	5BD
VT-147	7E	VT-193	8V	VT-238	5BB
VT-148	8AJ	VT-194	8AR	VT-239	4AA
VT-149	8AS	VT-195	5AQ	VT-241	8BN
VT-150	8R	VT-196	6S	VT-243	4AH
VT-151	8A	VT-197-A	5T	VT-255	5T
VT-151-B	8A	VT-198-A	7S	VT-245	8BA
VT-152	7S	VT-199	8N	VT-247	8Y
VT-153	8E	VT-200	4AJ	VT-260	4AJ
VT-161	8R	VT-201	7AC	VT-264	7BA
VT-162	8N	VT-201-C	7AC	VT-266	4P
VT-163	8G	VT-202	7BS	VT-268	8S
VT-167	8K	VT-203	7BD	VT-269	8BK
VT-168	7AC	VT-205	8Q	VT-288	8BK
VT-168-A	7AC			VT-289	8BD

b. Commercial Tubes. (See tube-base connection diagrams in Fig. 37.)

AD	4G	DE	4D	XXD	8AC
AF	4C	E	4D	XXL	5AC
AG	4C	G	4D	00	4D
AX	4Q	GA	5B	00A	4D
B	4E	H	4D	0A4	4V
BA	4J	LA	5B	0Z3	5N
BH	4J	PZ	5B	0Z4	4R
BR	4H	PZH	5B	01	4D
BX	4D	Wnd A	6N	01A	4D

Tube	Base
01AA	4D
01B	4D
D-½	4B
1	4G
D-1	4C
KR-1	4G
RA-1	4Q
RE-1	4C
SO-1	4Q
1A1	4A
1A3	5AP
1A4-P	4M
1A4-T	4K
1A5-G	6X
1A6-GT	6L
1A6-S	6L
1A7-G	7Z
1B1	4A
1B4	4K
1B5/25S	6M
1B7-G	7Z
1B8	8AW
1C1	4A
1C5-G	6X
1C6	6L
1C7	7Z
1C21	4V
1D1	4A
1D5, 1D5-GP	5Y
1D5-GT	5R
1D7-G	7Z
1D8-GT	8AJ
1E1	4A
1E4-G	5S
1E5-G	5R
1E5-GP	5Y
1E7-G	8C
1F1	4A
1F4	5K
1F5-G	6X
1F6	6W
1F7-G, GH, GV	7AD
1G1	4A
1G4-G	5S
1G5-G	6X
1G6-G	7AB
1H4-G	5S
1H5-G	5Z
1H6-G	7AA
1J1	4A
1J5-G	6X
1J6-G	7AB
1K1	4A
1L1	4T
1L4	6AR
1LA4	5AD
1LA6	7AK
1LB4	5AD
1LB6	8AX
1LC5	7AO
1LC6	7AK
1LD5	6AX
1LE3	4AA
1LH4	5AG
1LN5	7AO
1N1	4T
1N5-G	5Y
1N6-G	7AM
1P1	4T
1P5-G	5Y
1Q1	4T
1Q5-GT	6AF
1R1-G	4T
1R4/1294	4AH
1R5	7AT
1S1G	4T
1S4	7AV
1S5	6AU
1SA6	6BD
1SB6	6BE
1T1-G	4T
1T4	6AR
1T5	6AF
1T5-GT	6X
1-V	4G
1V1	4A
1Y1	4A
1Z1	4A
2	4A
G-2	5D
G-2S	5D
KR-2	4G
RE-2	4B
SO-2	4D
2A3	4D
2A3-H	4Q
2A4-G	5S
2A5	6B
2A6	6G
2A7	7C
2B4	5A
2B6	7J
2B7	7D
2C4	5AS
2C21/RK33	7BH
2C22	4AM
2C34/RK34	7BL
2E5	6R
2E22	5J
2G5	6R
2S/4S	5D
2V3-G	4Y
2W3	4X
2X2/879	4AB
2X3	4E
2Y2	4AB
2Y3	4C
2Y4	5D
2Z2	4B
3	4A
0A3/VR75	4AJ
0B3/VR90	4AJ
0C3/VR105	4AJ
0D3/VR150	4AJ
3A4	7BB
3A5	7BC
3A8-GT	8AS
3B5-GT	7AP
3B7/1291	7BE
3B21	4C
3B22	4C
3B23/RK22	4AN
3C5-GT	7AQ
3D6/1299	6BB
3LE4	6BA
3LF4	6BB
3Q4	7BA
3Q5-GT	7AP

Tube	Base
3S4	7BA
4	4A
G-4	5D
G-4 S	5D
4A6-G	8L
4B24	4C
4B25	4C
4S	5D
5	4A
A(5)	5H
KR5	5B
IN5-GT	5Y
5R4-GY	5T
5T4	5T
5U4-G	5T
5V4-G	5L
5W4	5T
5X3	4C
5X4G	5Q
5Y3-G	5T
5Y4-G	5Q
5Z3	4C
5Z4	5L
6	4A
A(6)	6N
6A3	4D
6A4/LA	5B
6A5-G	6T
6A6	7B
6AB5	6R
6AB6	7AU
6AB7/1853	8N
6AC5-G	6Q
6AC6-G	7W
6AC7/1852	8N
6AD5-G	6Q
6AD6-G	7AG
6AD7-G	8AY
6AE5-GT	6Q
6AE6-G	7AH
6AE7-GT	7AX
6AF5-G	6Q
6AF6-G	7AG
6AF7	8AG
6AG5	7BD
6AG7	8Y
6AH5-G	6AP
6AH7-GT	8BE
6AK5	6BD
6AK6	7BK
6AL6-G	6AM
6A7	7C
6A7-M	8A
6A7-S	7C
6A8	8A
6B4-G	5S
6B5	6AS
6B6-G	7V
6B7	7D
6B8	8E
6C4	6BG
6C5	6Q
6C5-G	6Q
6C6	6F
6C7	7G
6C8-G	8G
6D5	6Q
6D6	6F
6D7	7H
6D8-G	8A
6E5	6R
6E6	7B
6E7	7H
6F5	5M
6F5-G	5M
6F6	7S
6F7	7E
6F7-S	7E
6F8-G	8G
6G5	6R
6G6-G	7S
6G7	7N
6G7-S	7N
6H4-GT	5AF
6H5	6R
6H6	7Q
6H7	7P
6H7-S	7P
6H8	8F
6J5	6Q
6J6	7BF
6J7	7R
6J7-G	7R
6J7-GT	7R
6J8-G	8H
6K5-G	5U
6K6-G	7S
6K7	7R
6K8	8K
6L5-G	6Q
6L6	7AC
6L6-GX	7S
6L7	7T
6N5	6R
6N6-G	7AU
6N7	8B
6P5-G	6Q
6P7-G	7U
6Q5	6Q
6Q6-G	6Y
6Q7	7V
6R6-G	6AW
6R7	7V
6S6-GT	5AK
6S7-G	7R
6SA7	8R
6SA7-GT	8AD
6SC7	8S
6SD7-GT	8N
6SE7-GT	8N
6SF5	6AB
6SF7	7AZ
6SG7	8BC
6SH7	8BK
6SJ7	8N
6SK7	8N
6SL7-GT	8BD
6SN7-GT	8BD
6SQ7	8Q
6SR7	8Q
6SS7	8N
6ST7	8Q
6T5	6R
6T7-G	7V
6U5/6G5	6R
6U6-GT	7AC
6U7-G	7R
6V4	5D

Tube	Base
6V6	7AC
6V7-G	7V
6W5-G	6S
6W6-GT	7AC
6W7-G	7R
6X5	6S
6X6	7AL
6Y3	4AC
6Y5	6J
6Y6-G	7AC
6Y7-G	8B
6Z3	4G
6Z4	5D
6Z5	6K
6Z6	7Q
6Z7-G	8B
6ZY5-G	6S
7	4A
7A4	5AC
7A5	6AA
7A6	7AJ
7A7-LM	8V
7A8	8U
7B4	5AC
7B5	6AE
7B6	8W
7B7	8V
7B8	8X
7C4/1203A	4AH
7C5	6AA
7C6	8W
7C7	8V
7E5/1201	8BN
7E6	8W
7E7	8AE
7F7	8AC
7G7	8V
7H7	8V
7J7	8AR
7K7	8BF
7L7	8V
7N7	8AC
7P7	8V
7Q7	8AL
7R7	8AE
7S7	8BL
7T7	8V
7V7	8V
7W7	8BJ
7Y4	5AB
7Z4	5AB
8	4A
9	4A
10	4D
WX-12	4D
12A	4D
12A5	7F
12A6	7AC
12A7	7K
12A8-GT	8A
12AH7-GT	8BE
12B6	6Y
12B7	8V
12B8-GT	8T
12C8	8E
12E5-GT	6Q
12F5-GT	5M
12G7	7V
12H6	7Q
12J5-GT	6Q
12J7-GT	7R
12K7-GT	7R
12K8	8K
12L8-GT	8BU
12Q7-GT	7V
12SA7	8R
12SA7-GT	8AD
12SC7	8S
12SF5	6AB
12SF7	7AZ
12SG7	8BC
12SH7	8BK
12SJ7	8N
12SK7	8N
12SL7-GT	8BD
12SN7-GT	8BD
12SQ7	8Q
12SR7	8Q
12Z3	4Q
12Z5	6K
14	5E
14A4	5AC
14A5	6AA
14A7	8V
14AF7	8AC
14B6	8W
14B8	8X
14C5	6AA
14C7	8V
14E6	8W
14E7	8AE
14F7	8AC
14H7	8V
14J7	8AR
14N7	8AC
14Q7	8AL
14R7	8AE
14S7	8BL
14W7	8BJ
14Y4	5AB
14Z3	4G
15	5F
17	5A
18	6B
19	6C
RK19	4AN
20	4D
KR20	6N
RK21	4AB
22	4K
A-22	4D
AC22	5E
KR22	6N
RK22/3B23	4AN
K24	5E
RK24	4D
24A	5E
24S	5E
25	6M
KR25	6B
25A6	7S
25A7-G	8F
25AC5-GT	6Q
25B5	6D
25B6-G	7S
25B8-GT	8T
25C6-G	7AC
25D8-GT	8AF
25L6	7AC
25N6-G	7W
25S	6M

Tube	Base
25X6-GT	7Q
25Y4-GT	5AA
25Y5	6E
25Z3	4G
25Z4	5AA
25Z5	6E
25Z6	7Q
26	4D
A26	4D
27	5A
27HM	5A
27S	5A
K27	5A
A28	4D
29	6N
30	4D
A-30	4Q
R-30	4D
31	4D
KR31	4G
32	4K
A32	4Q
32L7-GT	8Z
33	5K
RK33/2C21	7BH
34	4M
RK34/2C34	7BL
35	5E
35A5-LT	6AA
35L6-GT	7AC
35Y4	5AL
35Z3-LT	4Z
35Z4-GT	5AA
35Z5-GT	6AD
35Z6-G	7Q
36	5E
37	5A
38	5F
39/44	5F
RK-39	5AW
40	4D
A40	4Q
40Z5	6AD
41	6B
41M	7S
42	6B
42A2	3S
42B2	3S
43	6B
43-MG	7S
44	5F
45	4D
45 special	4D
45Z3	5AM
45Z5-GT	6AD
46	5C
46A1	2S
46B1	2S
47	5B
RK47	5J
48	6A
A48	4Q
50	4D
VR50	4W
50A5	6AA
50C6-G	7AC
50L6-GT	7AC
50Y6-GT	7Q
50Z6-G	7Q
50Z7-G	8AN
51	5E
52	5C
53	7B
55	6Q
56	5A
56AS	5A
56S	5A
57	6F
57AS	6F
57S	6F
58	6F
58AS	6F
58S	6F
59	7A
59A	7A
59S	7A
HY61/807	5AW
RK62	4D
64	5E
65	5E
67	5A
68	5E
69	5E
70	6N
70A7-GT	8AB
70L7-GT	8AA
71A	4D
75	6G
75M	7V
75S	6G
VR75-30	4AJ
76	5A
77	6F
77M	7R
78	6F
78S	6F
79	6H
80	4C
81	4B
82	4C
82V	4L
83	4C
83V	4L
84/6Z4	5D
G-84	5D
85	6G
85AS	6G
85L7	8AB
85M	7V
85S	6G
86M	6Q
87S	6F
88	4C
88M	7R
88S	6F
89	6F
89RS	7N
VR105-30	4AJ
112A	4D
113HY	5K
HY-114B	2T
115HY	5K
117L7-GT	8AO
117M7-GT	8AO
117N7-GT	8AV
117P7-GT	8AV
117Z4-GT	5AA
117Z6-GT	7Q
125HY	5K
VR150-30	4AJ
165R	4A

Tube	Base
165R4	4A
165R8	4A
181	4D
182A	4D
182B	4D
183/483	4D
185R	4A
185R4	4A
185R8	4A
210T	4D
213, 213B	4C
216, 216B	4B
231D, WE 231D	4D
239A	4G
242C	4D
244A	5A
245A	4D
249B	4AU
252A	4D
257	5B
257A, WE 257A	3Q
259A	5E
264	4D
271A	5A
274-A	4C
274-B	5T
275-A	4D
282-A	4AR
283-A	5A
287A	5AU
291	5G
293	5G
295	5G
WE 300A	4D
WE 300B	4D
301A	4C
307A, WE 307-A	5J
310	4D
310A	6F
311A	5F
312A	6BK
323A	5AU
328	6F
348A	7R
349A	7S
350A, WE 350A	5AW
350B	7S
351A	6S
383A	5AT
385A	6BL
482A, 482B	4D
483	4D
484	5A
485	5A
486	5S
WL578/8020	4P
585	4D
586	4D
HY-615B	3P
713, 713A, WE-713A	8BK
717, 717A, WE 717A	8BK
801, 801A	4D
802	6BM
803	5J
804	5J
807	5AW
811	3O
812	3O
813	5BA
814	5J
816	4P
837	6BM
840	5J
841	4D
842	4D
843	5A
864	4D
865	4AR
866, 866A	4P
874	4S
878	4AU
879	4AB
884	6Q
885	5A
941	4D
942	4D
950	5K
951	4K
954	5BB
955	5BC
956	5BB
957	5BD
958	5BD
959	5BE
985	5D
986	4C
1005, CK1005	5AQ
1201/7E5	8BN
1203	4AH
1203A/7C4	4AH
1204	8BO
1221	6F
1223	7R
1231	8V
1232	8V
1284	8V
1291/3B7	7BE
1293	4AA
1294	4AH
1299/3D6	6BB
1602	4D
1603	6F
1608	4D
1609	5K
1610	5B
1612	7T
1613	7S
1614	7AC
1616	4P
1619	7AC
1620	7R
1621	7S
1622	7AC
1625	5AZ
1626	6Q
1629	7AL
1631	7AC
1632	7AC
1633	8BD
1634	8S
1635	8B
1642	7BH
1851	7R
1852	8N
1853	8N
2050	8BA
7184, KR 7184	6BO
8005	30
8013A	4P
8020/WL578	4P
9001	7BD
9002	7BS
9003	7BD
9004	4BJ
9005	5BG
9006	6BH

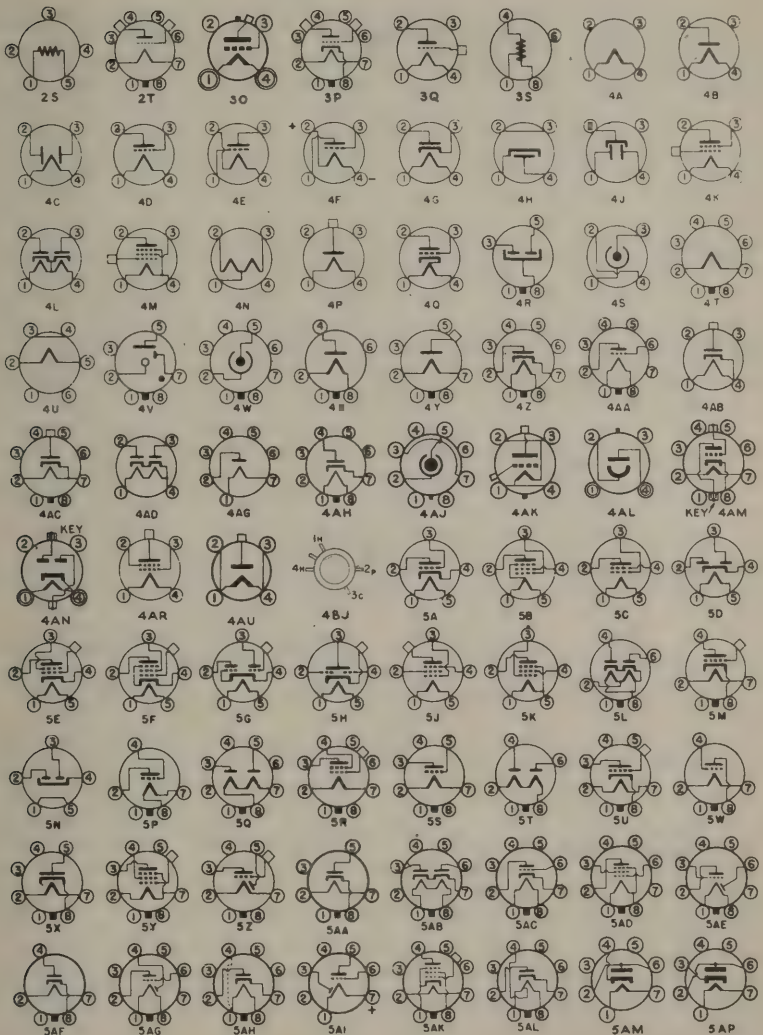

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FIG. 37. TUBE-BASE DIAGRAMS, 2S TO 5AP

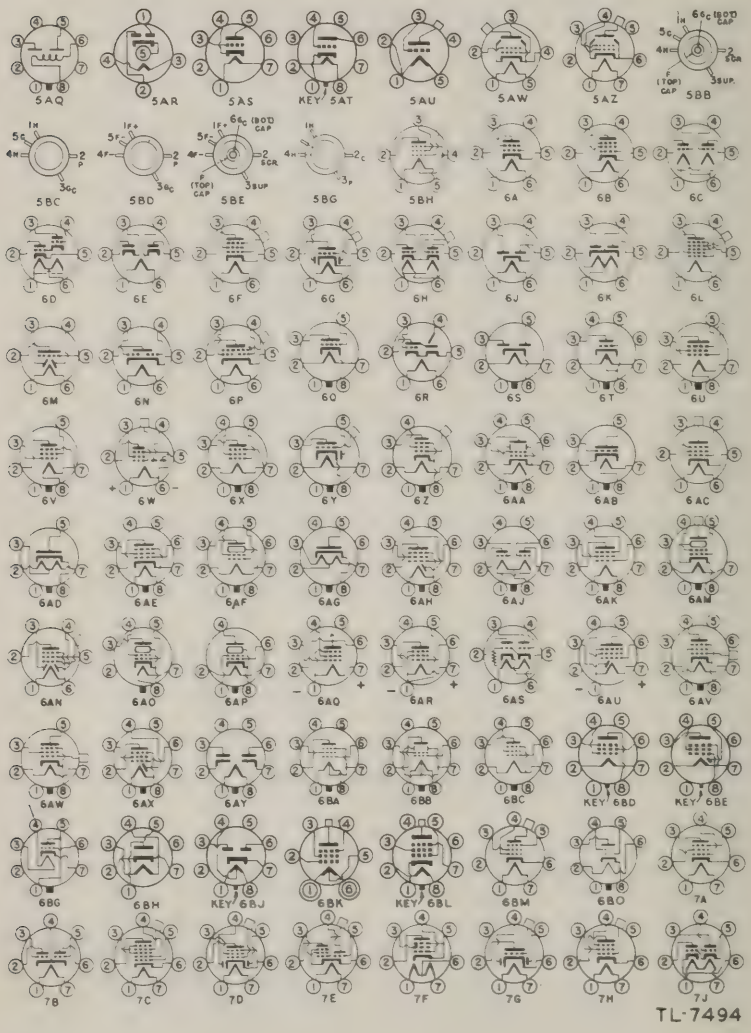

FIG. 37. TUBE-BASE DIAGRAMS, 5AQ TO 7J

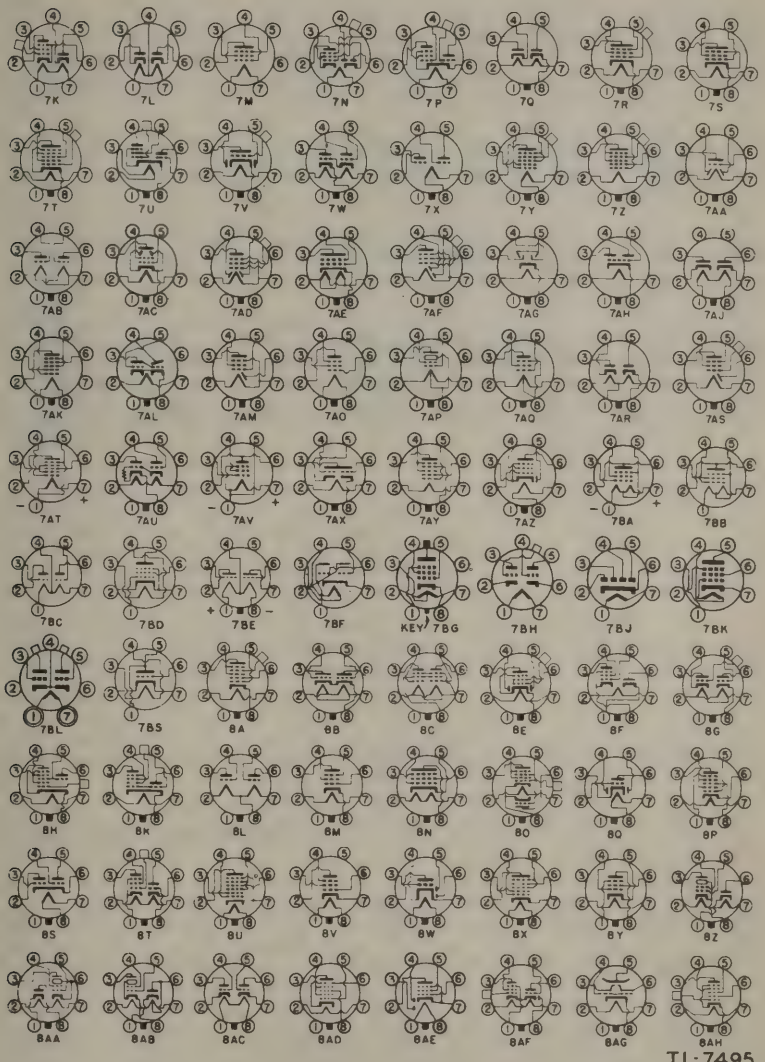

FIG. 37. TUBE-BASE DIAGRAMS, 7K TO 8AH

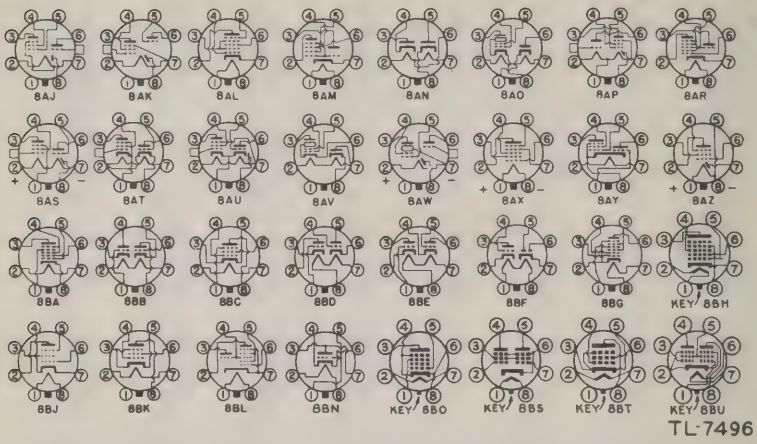

FIG. 37. TUBE-BASE DIAGRAMS, 8AJ TO 8BU

48. COMMERCIAL EQUIVALENTS OF SIGNAL CORPS TUBES.

Signal Corps tube	Commercial tube equivalent	Signal Corps tube	Commercial tube equivalent
VT-2	WE205B	VT-57	57
VT-4-B	211, 242A, 311	VT-58	58
VT-4-C	211 Special	VT-60	850
VT-5	WE215A, 215A	VT-62	801, 801A, 310
VT-7	WX12	VT-63	46
VT-17	860	VT-64	800, RK30
VT-19	861	VT-65	685
VT-22	204A	VT-65-A	6C5G
VT-24	864	VT-66	6F6
VT-25	10	VT-66-A	6F6G
VT-25-A	10 Special, 10Y	VT-67	30 Special
VT-26	22	VT-68	6B7
VT-27	30	VT-69	6D6
VT-28	24, 24A	VT-70	6F7
VT-29	27	VT-72	842, 942
VT-30	01A, 01	VT-73	843
VT-31	31	VT-74	5Z4
VT-33	33	VT-75	75
VT-34	207, F307	VT-76	76
VT-35	35/51	VT-77	77
VT-36	36, 36A	VT-78	78
VT-37	37, 37A	VT-80	80
VT-38	38, 38A	VT-83	83
VT-39	869	VT-84	84/6Z4
VT-39-A	869A, F369B	VT-86	6K7
VT-40	40	VT-86-A	6K7G
VT-41	851, 951	VT-86-B	6K7GT
VT-42	872, F-353A	VT-87	6L7
VT-42-A	872A Special filament	VT-87-A	6L7G
VT-43	A45, 845, 945, WE284D, 384D	VT-88	6R7
VT-44	32	VT-88-A	6R7G
VT-45	45	VT-88-B	6R7GT
VT-46	866, 966	VT-89	89
VT-46-A	866A, 966A	VT-90	6H6
VT-47	47	VT-90-A	6H6GT, 6H6GT/G
VT-48	41	VT-91	6J7
VT-49	39/44	VT-91-A	6J7GT
VT-50	50, 585, 586	VT-92	6Q7
VT-51	841, PT841, 941	VT-92-A	6Q7G
VT-52	45 Special	VT-93	6B8
VT-54	34	VT-93-A	6B8G
VT-55	865	VT-94	6J5
VT-56	56	VT-94-A	6J5G

Signal Corps tube	Commercial tube equivalent
VT-94-D	6J5GT
VT-95	2A3
VT-96	6N7
VT-97	5W4
VT-98	6U5/6G5, 6G5, 6U5
VT-99	6F8G
VT-100	807, RK39, HY61, HY61/807
VT-100-A	807, 807A, Modified
VT-101	837, RK44
VT-103	6SQ7
VT-104	12SQ7
VT-105	6SC7
VT-106	803, RKE8A, WE322A
VT-107	6V6
VT-107-A	6V6GT, 6V6GT/G
VT-107-B	6V6G
VT-108	450TH, WL450, HK854H
VT-109	2051, WL630
VT-111	2525D5, 5BP4/1808P4, 1802P4
VT-112	6AC7/1852, 1852
VT-114	5T4
VT-115	6L6
VT-115-A	6L6G, 6L6GA
VT-116, VT-116-B	6SJ7
VT-116-A	6SJ7GT
VT-116-B	6SJ7Y, 6SJ7 special *(micanol or ceramic base)*
VT-117	6SK7
VT-117-A	6SK7GT
VT-118	832
VT-119	2X2/879
VT-120	954
VT-121	955
VT-122	WL530, 530
VT-124	1A5GT, 1A5GT/G
VT-125	1C5GT, 1C5GT/G
VT-126	6X5
VT-126-A	6X5G
VT-126-B	6X5GT, 6X5GT/G
VT-127	100TS
VT-127-A	100TS modified
VT-128	1630, A5588
VT-129	304TL, WL525, HK304L
VT-130	250TL, HK454L
VT-131	12SK7
VT-132	12K8 special, 12K8
VT-133	12SR7
VT-134	12A6
VT-135	12J5GT
VT-135-A	12J5
VT-136	1625
VT-137	1626
VT-138	1629
VT-139	OD3/VR150, VR150-30, VR150
VT-141	53L, WL531
VT-142	WE31DY1
VT-143	805, WE331A, 905, RK57
VT-144	813
VT-145	5Z3
VT-146	IN5GT, IN5GT/G
VT-147	1A7GT
VT-148	1D8GT
VT-149	3A8GT
VT-150	6SA7
VT-150-A	6SA7GT
VT-151	6A8G
VT-151-B	6A8GT
VT-152	6K6GT, 6K6GT/G
VT-152-A	6K6G
VT-153	12C8 special
VT-154	814, 12C8Y, RK47
VT-161	814(GL), 12SA7
VT-162	12SJ7
VT-163	6C8G
VT-164	1619
VT-165	1624
VT-166	371A, Amperex 221A, WE371A
VT-167	6K8
VT-167-A	6K8G
VT-168-A	6Y6G
VT-169	12C8
VT-170	1E5GP
VT-171	1R5
VT-171-A	1R5 loctal
VT-172	1S5
VT-173	1T4
VT-174	3S4

Signal Corps tube	Commercial tube equivalent
VT-175	1613, 6L6GX
VT-176	6AB7/1853, 6AB7, 1853
VT-177	1LH4
VT-178	1LC6
VT-179	1LN5
VT-180	3LF4
VT-181	7Z4
VT-182	3B7/1291, 3B7, 1291
VT-183	1R4/1294, 1294, 1R4
VT-184	VR90-30, OB3/VR90, VR90
VT-185	3D6/1299, 3D6, 1299
VT-187	575A, F375A, 975A, GL512
VT-188	7E6
VT-189	7F7
VT-190	7H7
VT-191	316A
VT-192	7A4
VT-193	7C7
VT-194	7J7
VT-195	CK1005, 1005
VT-196	6W5C
VT-197-A	5Y3GT/G, 5Y3GT
VT-198-A	6G6G
VT-199	6SS7
VT-200	VR105-30, VR105
VT-201	25L6
VT-201-C	25L6GT, 25L6GT/G
VT-202	9002
VT-203	9003
VT-204	3C24, HK24G
VT-205	6ST7
VT-206-A	5V4G, 274B
VT-207	12AH7GT
VT-208	7B8
VT-209	12SG7
VT-210	1S4
VT-211	6SG7
VT-212	958
VT-213-A	6L5G
VT-214	12H6
VT-215	6E5
VT-216	816, 866JR, 2B26
VT-217	811
VT-218	100TH, RK38
VT-219	8007
VT-220	250TH, RK63, HK454
VT-221	3Q5GT, 3Q5GT/G
VT-222	884
VT-223	1H5GT, 1H5GT/G
VT-224	RK34
VT-225	WE307A, 307A
VT-226	3EP1/1806P1, 3EP1, 1806P1
VT-227	7184, KR7184
VT-228	8012
VT-229	6SL7GT
VT-230	350A
VT-231	6SN7GT
VT-232	1148, E1148, HYE1148
VT-233	6SR7
VT-234	HY/114B, NU114B
VT-235	HY615, NU615
VT-236	836
VT-237	957
VT-238	956
VT-239	1LE3
VT-240	710A, WL538, 8011, WE710A
VT-241	7E5/1201, 7E5, 1201
VT-243	7C4/1203A, 7C4, 1203
VT-244	5U4G
VT-245	2050
VT-246	918, CE1, PJ23
VT-247	6AG7
VT-248	3CP1/1808P1, 3CP1-S1, 3CP1, 1808P1
VT-249	CK1006, 1006
VT-250	EF50
VT-251	WL441 series, 2J30 to 2J34S "K" series
VT-252	923
VT-254	304TH, WL535, HK304M
VT-255	705A, 8021, WE705A
VT-256	GL486, ZP486
VT-257	K-7
VT-259	829
VT-260	VR-75-30
VT-264	3Q4
VT-266	1616, 866JR, 660
VT-267	578, WL578
VT-268	12SC7
VT-269	717A, WE717A

Commercial type	Signal Corps equivalent
32	VT-44
33	VT-33
34	VT-54
RK34	VT-224
35, 35/51	VT-35
36, 36A	VT-36
37, 37A	VT-37
38, 38A	VT-38
RK38	VT-218
39, 39/44	VT-49
WE39DY1	VT-142
RK39	VT-100
40	VT-40
41	VT-48
44	VT-49
RK44	VT-101
45	VT-45
A45	VT-45
45 special	VT-52
46	VT-63
47	VT-47
RK47	VT-154
50	VT-50
EF50	VT-250
51	VT-35
56	VT-56
RK57	VT-143
57	VT-57
58	VT-58
HY61, HY61/807	VT-100
RK63	VT-220
75	VT-75
VR75-30	VT-260
76	VT-76
77	VT-77
78	VT-78
80	VT-80
83	VT-83
84, 84/6Z4	VT-84
89	VT-89
VR90, VR90-30	VT-184
98	VT-84
100TH	VT-218
100TS	VT-127
100TS modified	VT-127-A
VR105, VR105-30	VT-200
HY114B, NU114B	VT-234
VR150, VR150-30	VT-139
204A	VT-22
WE205B	VT-2
207	VT-34
211	VT-4-B
211 special	VT-4-C
215A, WE215A	VT-5
Amperex 221A	VT-166
242A	VT-4-B
250TH	VT-220
250TL	VT-130
274B	VT-206-A
WE284D	VT-43
HK304L	VT-129
304TH, HK304M	VT-254
304TL	VT-129
F307	VT-34
307A, WE307A	VT-225
310	VT-62
311	VT-4-B
WE316A	VT-191
WE322A	VT-106
WE331A	VT-143
WE350A	VT-230
F353A	VT-42
F369B	VT-39-A
371A, WE371A	VT-166
F375A	VT-187
384D	VT-43
417, WL417	VT-277
WL441 series	VT-251
450TH, WL450	VT-108
HK454H	VT-220
HK454L	VT-130
ZP486, GL486	VT-256
ZG489	VT-282
GL512	VT-187
WL525	VT-129
530, WL530	VT-122
531, WL531	VT-141
WL535	VT-254
WL538	VT-240
575A	VT-187

Commercial type	Signal Corps equivalent
578, WL578	VT-267
585, 586	VT-50
HY615, NU615	VT-235
WL630	VT-109
WE705A	VT-255
710A, WE710A	VT-240
WE717A	VT-269
800	VT-64
801, 801A	VT-62
803	VT-106
805	VT-143
807	VT-100
807A, 807 modified	VT-100-A
811	VT-217
813	VT-144
814, 814 (GL)	VT-154
815	VT-287
816	VT-216
829	VT-259
832	VT-118
832A	VT-286
836	VT-236
837	VT-101
841, PT841	VT-51
842	VT-72
843	VT-73
845	VT-43
850	VT-60
851	VT-41
HK854H	VT-108
860	VT-17
861	VT-19
864, 864 special	VT-24
865	VT-55
866	VT-46
866A, 866JR	VT-46-A
869	VT-39
869A	VT-39-A
872	VT-42
872A	VT-42-A
879	VT-119
884	VT-222
905	VT-143
918	VT-246
923	VT-252
CW931	VT-2
941	VT-51
942	VT-72
945	VT-43
951	VT-41
954	VT-120
955	VT-121
956	VT-238
957	VT-237
958	VT-212
966	VT-46
966A	VT-46-A
972	VT-42
975A	VT-187
1005, CK1005	VT-195
1006, CK1006	VT-249
1148, E1148, HY-E1148	VT-232
1201	VT-241
1203A	VT-243
1291	VT-182
1294	VT-183
1299	VT-185
1613	VT-175
1616	VT-266
1619	VT-164
1624	VT-165
1625	VT-136
1626	VT-137
1629	VT-138
1630	VT-128
1802P4	VT-111
1806P1	VT-226
1808P1	VT-248
1852	VT-112
1853	VT-176
2050	VT-245
2051	VT-109
2525D5	VT-111
A5586	VT-123
A5588	VT-128
7184, KR7184	VT-227
8007	VT-219
8011	VT-240
8012	VT-228
8021	VT-255
9002	VT-202
9003	VT-203
D161831	VT-279

50. TUBE TESTING DATA. The following data supplements tube testing data in tube charts and instruction books for the combination tester in Test Set I-56-(*). This paragraph contains **additional** tube-testing information and **corrects** data appearing in tube charts and instruction books. USE THIS DATA RATHER THAN THE DATA APPEARING ON THE TUBE CHARTS. (See paragraph 18 for detailed instructions on testing tubes.)

NOTE: Slide switch settings which are preceded by an asterisk (*) must be set first, to test for shorted electrodes. **Tube type numbers followed by a dagger (†) indicate tubes that must never be given the "short" test in the combination tester.** See paragraph 18 for the testing procedure for dagger-marked tubes. When no slide switch setting is given, leave the slide switch at position 1. The designation "Good Tube Reads 20", or some other value, is the reading on the 0-10 d-c scale of the meter multiplied by 10. The letters G, GT or GT G at the end of a commercial tube number designate the type and size of glass envelope used on the tube, and are not to be considered when looking up a tube on the tube chart.

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
VT-94	4	27	6.3	....	*3	....	....	....	....	*2	2	....	VT-94
VT-94-D	4	27	6.3	....	*3	....	....	....	....	*2	2	....	VT-94-D
VT-112	4	21	6.3	....	*3	....	....	2	....	*2	....	....	VT-112
VT-115-A	4	27	6.3	....	*3	....	....	....	....	*2	2	....	VT-115-A
VT-116-B	4	27	6.3	....	*3	....	....	2	....	*2	....	....	VT-116-B
VT-124†	3	50	1.4	....	*3	....	....	....	....	2	....	....	†VT-124
VT-125†	3	37	1.4	....	*3	....	....	....	....	2	....	....	†VT-125
VT-135-A	4	28	12.6	....	*3	....	....	....	....	*2	2	....	VT-135-A
VT-146†	2	27	1.4	....	*3	....	....	....	....	2	....	....	†VT-146
VT-147†	2	41	1.4	....	*3	....	....	....	....	2	....	....	†VT-147
VT-148†	3	37	1.4	....	*3	....	....	....	4	2	4	2	†VT-148
Test 2	3	48	1.4	....	*3	4	4	2	....	2	2	....	Test 2
Test 3	3	95	1.4	....	*3	4	4	2	4	2	....	2	Test 3
VT-149†	1	36	1.4	4	*3	....	4	Fil. continuity test only					†VT-149
VT-149†	2	36	1.4	2	3	....	....	4	4	3	2	....	†VT-149
Test 1	2	36	1.4	2	3	4	4	....	....	3	2	4	Test 1
Test 2	2	45	1.4	2	3	4	4	4	2	3	....	2	Test 2
VT-165	4	23	2.5	*3	....	....	....	2	....	....	....	....	VT-165
VT-168-A	4	19	6.3	....	*3	....	....	....	....	*2	2	....	VT-168-A
VT-171, VT-171-A†	3	40	1.4	2	....	....	....	4	....	*3	....	....	VT-171, †VT-171-A
VT-172†	2	41	1.4	2	....	2	....	....	....	*3	....	....	†VT-172
Test 2	2	55	1.4	2	....	....	2	4	4	*3	....	....	Test 2

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
VT-173†	3	35	1.4	2	....	....	....	4	....	*3	....	....	†VT-173
VT-174†	1	35	1.4	*3	....	....	....	4	Fil. continuity test only				†VT-174
VT-174†	3	35	1.4	*3	....	....	....	2	4	3	....	....	†VT-174
VT-175	4	30	6.3	....	*3	....	....	....	....	*2	2	....	VT-175
VT-176	4	23	6.3	....	*3	....	....	2	....	*2	....	....	VT-176
VT-177†	2	40	1.4	*3	....	....	2	....	....	....	2	....	†VT-177
Test 2	2	95	1.4	*3	2	....	....	....	2	....	2	....	Test 2
				Good tube reads 20									
VT-178†	2	43	1.4	*3	....	....	....	....	....	....	2	....	†VT-178
VT-179†	3	40	1.4	*3	....	....	....	4	....	....	2	....	†VT-179
VT-180	3	30	1.5	*3	....	....	....	....	....	*2	*4	....	VT-180
VT-181	4	49	6.3	*3	....	2	....	....	....	2	*2	....	VT-181
Test 2	4	41	6.3	*3	....	....	....	....	2	2	*2	....	Test 2
VT-182†	1	33	1.5	*2	....	....	4	Fil. continuity test only					†VT-182
VT-182†	2	33	1.5	2	2	2	3	....	....	....	2	....	†VT-182
Test 2	2	33	1.5	2	....	....	3	....	2	2	2	....	Test 2
VT-183†	2	57	1.5	*3	....	....	....	....	....	*2	*2	....	†VT-183
VT-185	3	25	1.5	*3	....	....	....	....	....	*2	*3	....	VT-185
VT-187*				Not suitable for testing, exceeds 10 Watts									*VT-187
VT-188	4	28	6.3	*3	....	....	*4	4	4	2	*2	....	VT-188
Test 2	2	45	6.3	3	4	4	*4	2	....	2	*2	....	Test 2
Test 3	2	45	6.3	*3	4	4	*4	....	2	2	*2	....	Test 3
VT-189	4	30	6.3	*3	2	4	4	....	....	2	*2	....	VT-189
Test 2	4	30	6.3	*3	2	....	....	4	4	2	*2	....	Test 2
VT-190	4	22	6.3	*3	....	....	....	....	....	2	*2	....	VT-190
VT-192	4	27	6.3	*3	....	....	....	....	....	2	*2	....	VT-192
VT-193	4	33	6.3	*3	....	....	....	....	....	2	*2	....	VT-193
VT-194	4	33	6.3	*3	....	4	4	....	....	2	*2	....	VT-194
Test 2	4	33	6.3	*3	4	....	....	4	4	2	*2	....	Test 2
VT-195	6	33	12.6	....	....	2	....	....	3	....	2	....	VT-195
Test 2	6	33	12.6	....	....	....	....	2	3	....	2	....	Test 2
				No Short Test									
VT-196	4	25	6.3	....	*3	2	....	....	....	*2	2	....	VT-196
Test 2	4	25	6.3	....	*3	....	....	2	....	*2	2	....	Test 2
VT-197-A	4	57	5	....	*3	....	2	....	....	....	*2	....	VT-197-A
Test 2	4	57	5	....	*3	....	....	....	2	....	*2	....	Test 2
VT-198-A	4	36	6.3	....	*3	....	....	....	....	*2	2	....	VT-198-A
VT-199	4	30	6.3	....	*3	....	....	2	....	*2	....	....	VT-199
VT-201	4	22	25	....	*3	....	....	....	....	*2	2	....	VT-201
VT-201-C	4	22	25	....	*3	....	....	....	....	*2	2	....	VT-201-C
VT-202	4	27	6.3	....	2	*2	*3	*4	....	2	....	....	VT-202
				Shows short on F & K									
VT-203	4	27	6.3	....	2	*2	*3	....	....	2	....	....	VT-203

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
VT-204	4	27	6.3	....	2	*2	*3	....	....	2	....	....	VT-204
				Shows short on F & K									
VT-205	4	30	6.3	....	....	2	4	4	....	*3	*2	....	VT-205
Test 2	2	95	6.3	....	4	2	2	....	4	*3	*2	....	Test 2
Test 3	2	95	6.3	....	4	2	....	2	4	*3	*2	....	Test 3
VT-206-A	4	25	5	....	*3	....	2	....	....	....	*2	....	VT-206-A
Test 2	4	25	5	....	*3	....	....	....	2	....	*2	....	Test 2
VT-207	4	30	12.6	4	2	4	2	....	....	*3	*2	....	VT-207
Test 2	2	30	12.6	....	2	....	2	4	4	*3	*2	....	Test 2
VT-208	4	27	6.3	*3	....	....	....	....	....	2	*2	....	VT-208
VT-209	4	19	12.6	....	*3	*4	....	2	....	*2	....	....	VT-209
VT-210†	3	30	1.4	2	....	....	....	4	4	*3	....	....	†VT-210
VT-211	4	19	6.3	....	*3	*4	....	2	....	*2	....	....	VT-211
VT-212	2	20	1.4	....	*3	....	....	....	....	*2	2	....	VT-212
				Use Acorn Adapter BN									
VT-213-A	4	32	6.3	....	*3	....	....	....	....	*2	2	....	VT-213-A
VT-214	2	25	12.6	....	*3	4	2	....	....	*2	2	....	VT-214
Test 2	2	25	12.6	....	*3	....	2	4	....	*2	2	....	Test
VT-215	3	36	6.3	*3	....	....	....	2	*2	....	....	....	VT-215
Glo Test	5	CL	6.3	*3	....	2	....	2	*2	....	....	....	Glo Test
Glo Test	5	OP	6.3	*3	4	2	....	2	*2	....	....	....	Glo Test
VT-221†	1	33	1.4	....	*2	Fil. continuity test only				....	4	....	†VT-221
VT-221†	4	33	1.4	....	2	....	....	....	....	2	3	....	†VT-221
VT-223†	2	33	1.4	....	*3	....	....	4	....	2	....	....	†VT-223
Test 2	2	40	1.4	....	*3	2	....	....	....	2	....	....	Test 2
VT-224	4	27	6.3	*3	....	4	2	....	....	*2	....	....	VT-224
				Top cap lead on left top cap									
Test 2	4	27	6.3	*3	....	....	2	4	....	*2	....	....	Test 2
				Top cap lead on right top cap									
VT-225	4	24	5	*3	....	....	....	*2	....	....	....	....	VT-225
VT-227	4	26	6.3	....	*3	....	....	....	....	*2	2	....	VT-227
VT-229	4	28	6.3	4	4	2	....	....	2	*3	*2	....	VT-229
Test 2	4	28	6.3	....	....	2	4	4	2	*3	*2	....	Test 2
VT-231	4	29	6.3	....	....	2	4	4	....	*2	*3	....	VT-231
Test 2	4	29	6.3	4	4	4	....	....	2	*3	*2	....	Test 2
VT-233	4	37	6.3	....	....	2	4	4	....	*2	*3	....	VT-233
Test 2	2	33	6.3	....	4	2	2	....	4	*2	*3	....	Test 2
Test 3	2	33	6.3	....	4	2	....	2	4	*2	*3	....	Test 3
VT-234	4	55	1.4	....	*3	....	....	....	....	*2	....	....	VT-234
				Short top caps together									
VT-235	3	31	6.3	....	*3	....	....	....	....	*2	2	....	VT-235
				Short top caps together									
VT-237	2	30	1.4	....	*3	....	....	....	....	*2	2	....	VT-237
				Use Acorn Adapter BN									

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
VT-238	3	30	6.3	....	*3	....	....	....	....	*2	2	....	VT-238
				Use Acorn Adapter BN									
VT-239†	3	37	1.4	*3	....	....	....	....	....	....	2	....	†VT-239
VT-241	4	20	6.3	*4	*3	....	*4	....	2	*4	*2	....	VT-241
VT-243	2	33	6.3	*3	....	....	....	....	....	2	*2	....	VT-243
VT-245	4	15	6.3	....	3	....	....	....	....	2	2	....	VT-245
				No short test									
VT-264	3	33	1.4	*3	....	....	....	*2	*4	*3	....	....	VT-264
VT-266	4	57	2.5	*3	....	....	*2	....	....	....	....	....	VT-266
VT-268	4	30	12.6	....	4	4	....	....	2	*2	*3	....	VT-268
Test 2	4	30	12.6	....	....	....	4	4	2	*2	*3	....	Test 2
VT-269	4	20	6.3	....	*3	2	....	2	....	*2	....	....	VT-269
				Shows short on G and I									
VT-288	4	19	12.6	....	*3	*4	....	2	....	*2	....	....	VT-288
VT-289	4	28	12.6	4	4	2	....	....	2	*3	*2	....	VT-289
Test 2	4	28	12.6	....	....	2	4	4	2	*3	*2	....	Test 2
AF	4	24	2.5	*3	2	....	*2	....	....	....	....	....	AF
Test 2	4	24	2.5	*3	....	2	*2	....	....	....	....	....	Test 2
AG	4	26	5	*3	2	....	*2	....	....	....	....	....	AG
Test 2	4	26	5	*3	....	2	*2	....	....	....	....	....	Test 2
PZ	4	41	2.5	*3	....	....	....	*2	....	....	....	....	PZ
PZH	4	36	2.5	*3	....	....	....	2	*2	....	....	....	PZH
1A3	2	75	1.4	*2	....	2	....	....	*4	*3	....	....	1A3
1A4-P†	2	28	2	*3	....	....	2	....	....	....	....	....	†1A4-P
1A5†	3	50	1.4	....	*3	....	....	....	....	2	....	....	†1A5
1A6†	3	39	2	*3	....	....	....	....	2	....	....	....	†1A6
1A7†	2	41	1.4	....	*3	....	....	....	....	2	....	....	†1A7
1B4†	2	27	2	*3	....	....	2	....	....	....	....	....	†1B4
1B4-P†	3	35	2	*3	....	....	*2	....	....	....	....	....	†1B4-P
1B5†	2	31	2	*3	....	4	2	....	2	....	....	....	†1B5
Test 2	2	40	2	*3	4	4	....	2	2	....	....	....	Test 2
Test 3	2	40	2	*3	4	....	4	2	2	2	....	....	Test 3
1B7†	2	31	1.4	....	*3	....	....	....	....	2	....	....	†1B7
1B8†	3	52	1.4	....	*3	....	....	....	4	2	4	4	†1B8
Test 2	3	60	1.4	....	*3	4	4	4	....	2	....	....	Test 2
Test 3	2	95	1.4	....	*3	4	4	4	2	2	....	2	Test 3
1C5†	3	37	1.4	....	*3	....	....	....	....	2	....	....	†1C5
1C6†	3	40	2	*3	....	....	....	....	2	....	....	....	†1C6
1D5, 1D5-GP†	3	33	2	....	*3	....	....	....	....	2	....	....	1D5, †1D5-GP
1D8†	3	37	1.4	....	*3	....	....	....	4	2	4	2	†1D8
Test 2	3	48	1.4	....	*3	4	4	2	....	2	2	....	Test 2
Test 3	3	95	1.4	....	*3	4	4	2	4	2	....	2	Test 3
1E4†	3	45	1.4	....	*3	....	....	....	....	2	....	....	†1E4
1E5†	2	35	2	....	*3	....	....	....	....	2	....	....	†1E5

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
1E7†	3	30	2	....	*3	2	....	....	....	2	....	....	†1E7
Test 2	3	30	2	....	*3	....	....	....	2	2	....	....	Test 2
1F7†	2	35	2	....	*3	4	4	....	....	2	....	....	†1F7
Test 2	2	95	2	....	*3	4	4	....	2	2	....	2	Test 2
Test 3	2	95	2	....	*3	4	....	4	2	2	....	2	Test 3
1G4†	2	30	1.4	....	*3	....	....	....	....	2	....	....	†1G4
1G5†	3	39	2	....	*3	....	....	....	....	2	....	....	†1G5
1G6†	2	35	1.4	....	*3	4	4	....	....	2	....	....	†1G6
Test 2	3	40	1.4	....	*3	....	....	4	4	2	....	....	Test 2
1H4†	3	41	2	....	*3	....	....	....	....	2	....	....	†1H4
1H5†	2	33	1.4	....	*3	....	....	4	....	2	....	....	†1H5
Test 2	2	40	1.4	....	*3	2	....	....	....	2	....	2	Test 2
1H6†	2	30	2	....	*3	....	2	2	....	2	....	....	†1H6
Test 2	2	40	2	....	*3	2	4	....	2	2	....	....	Test 2
Test 3	2	40	2	....	*3	2	....	4	2	2	....	....	Test 3
1J5†	3	38	2	....	*3	....	....	....	....	2	....	....	†1J5
1J6†	3	39	2	....	*3	2	2	....	....	2	....	....	†1J6
Test 2	3	39	2	....	*3	....	....	2	2	2	....	....	Test 2
1L4†	3	33	1.4	2	....	....	....	2	....	*3	....	....	†1L4
1N5†	2	27	1.4	....	*3	....	....	....	....	2	....	....	†1N5
1N6†	3	38	1.4	....	*3	....	....	....	2	2	....	....	†1N6
Test 2	2	95	1.4	....	*3	4	4	2	....	2	....	....	Test 2
Good tube reads 20													
1P5†	2	31	1.4	....	*3	....	....	....	....	2	....	....	†1P5
1Q5†	3	33	1.4	....	*3	....	....	....	....	2	....	....	†1Q5
1R4†	2	57	1.5	*3	....	....	....	....	2	2	....	....	†1R4
1R5†	3	40	1.4	2	....	....	....	4	....	*3	....	....	†1R5
1S4†	3	30	1.4	2	....	....	....	4	4	*3	....	....	†1S4
1S5†	2	41	1.4	2	....	2	....	....	....	*3	....	....	†1S5
Test 2	2	41	1.4	2	....	....	2	4	4	*3	....	....	Test 2
1T4†	3	35	1.4	2	....	....	....	4	....	*3	....	....	†1T4
1T5†	3	40	1.4	....	*3	....	....	....	....	2	....	....	†1T5
1LA4†	3	40	1.4	*3	....	....	....	....	....	....	2	....	†1LA4
1LA6†	3	35	1.4	*3	....	....	....	....	....	....	2	....	†1LA6
1LB4†	3	40	1.4	*3	....	....	....	....	....	....	2	....	†1LB4
1LB6†	2	32	1.4	*3	....	....	....	....	....	....	2	....	†1LB6
1LC5†	2	32	1.4	*3	....	....	....	4	....	....	2	....	†1LC5
1LC6†	2	43	1.4	*3	....	....	....	....	....	....	2	....	†1LC6
1LD5†	2	32	1.4	*3	....	....	2	....	....	....	2	....	†1LD5
Test 2	2	95	1.4	*3	4	4	....	....	2	....	2	....	Test 2
Good tube reads 20													
1LE3†	3	37	1.4	*3	....	....	....	....	....	....	2	....	†1LE3
1LH4†	2	40	1.4	*3	....	....	2	....	....	....	2	....	†1LH4
Test 2	2	95	1.4	*3	2	....	....	....	2	....	2	....	Test 2
Good tube reads 20													

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
1LN5†	3	40	1.4	*3	....	....	....	4	....	....	2	....	†1LN5
1SA6-GT†	3	30	1.4	....	*3	....	....	....	....	2	....	....	†1SA6-GT
1SB6-GT†	2	36	1.4	....	*3	....	....	4	....	2	....	....	†1SB6-GT
Test 2	2	90	1.4	....	*3	4	4	....	....	*2	4	....	Test 2
G-2	2	45	2.5	*3	2	....	2	*2	....	....	....	....	G-2
Test 2	2	45	2.5	*3	....	2	2	*2	....	....	....	....	Test 2
2x2/879	6	70	2.5	*3	....	....	*2	....	....	....	....	....	2x2/879
3A4†	1	30	1.4	*2	....	....	....	4	Fil. continuity test only				†3A4
3A4†	3	30	1.4	2	....	....	....	2	4	3	....	....	†3A4
3A5†	1	33	1.4	*2	....	....	4	Fil. continuity test only					†3A5
3A5†	3	33	1.4	2	....	....	3	4	4	2	....	....	†3A5
Test 2	3	33	1.4	2	4	4	3	....	....	2	....	....	Test 2
3A8†	1	36	1.4	4	*3	....	4	Fil. continuity test only					†3A8
3A8†	2	36	1.4	2	3	....	....	4	4	3	2	....	†3A8
Test 1	2	36	1.4	2	3	4	4	....	....	3	2	4	Test 1
Test 2	2	45	1.4	2	3	4	4	4	2	3	....	2	Test 2
3B5†	3	35	1.4	....	*3	....	....	....	....	2	3	....	†3B5
3B7†	1	33	1.5	*2	....	....	4	Fil. continuity test only					†3B7
3B7†	2	33	1.5	2	2	2	3	....	....	....	2	....	†3B7
Test 2	2	33	1.5	2	....	....	3	....	2	2	2	....	Test 2
3LF4	3	30	1.5	*3	....	....	....	....	....	*2	*4	....	3LF4
3Q5†	1	33	1.4	....	*2	Fil. continuity test only				....	4	....	†3Q5
3Q5†	4	33	1.4	....	2	....	....	....	....	2	3	....	†3Q5
3S4†	1	35	1.4	*3	....	....	....	4	Fil. continuity test only				†3S4
3S4†	3	35	1.4	*3	....	....	....	2	4	3	....	....	†3S4
G-4	2	45	2.5	*3	2	....	2	*2	....	....	....	....	G-4
Test 2	2	45	2.5	*3	....	2	2	*2	....	....	....	....	Test 2
KR5	4	36	6.3	*3	....	....	....	*2	....	....	....	....	KR5
5X3	4	43	5	*3	....	2	*2	....	....	....	....	....	5X3
Test 2	4	43	5	*3	2	....	*2	....	....	....	....	....	Test 2
6AD5	2	37	6.3	*3	....	....	....	2	*2	....	....	....	6AD5
Glo Test	5	CL	6.3	*3	....	2	....	2	*2	....	....	....	Glo Test
Glo Test	5	OP	6.3	*3	4	2	....	2	*2	....	....	....	Glo Test
6AG5	4	20	6.3	....	2	*3	*2	....	....	2	....	....	6AG5
				Shows short on F and K									
6C4	4	28	6.3	*4	....	*3	*2	....	....	2	....	....	6C4
6J6	4	19	6.3	....	2	*3	*2	2	....	2	....	....	6J6
Test 2	4	19	6.3	2	....	*3	*2	....	2	2	....	....	Test 2
6SF7	4	30	6.3	....	....	2	....	4	....	*3	*2	....	6SF7
Test 2	2	53	6.3	....	4	2	4	....	4	*3	*2	....	Test 2
6SG7	4	19	6.3	....	*3	*4	....	2	....	*2	....	....	6SG7
6SH7	4	19	6.3	....	*3	*4	....	2	....	*2	....	....	6SH7

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
6SL7	4	28	6.3	4	4	2	....	....	2	*3	*2	....	6SL7
Test 2	4	28	6.3	....	....	2	4	4	2	*3	*2	....	Test 2
6ST7	4	30	6.3	....	....	2	4	4	....	*3	*2	....	6ST7
Test 2	2	95	6.3	....	4	2	2	....	4	*3	*2	....	Test 2
Test 3	2	95	6.3	....	4	2	....	2	4	*3	*2	....	Test 3
7G7	4	19	6.3	*3	....	....	....	....	....	2	*2	....	7G7
7R7	4	20	6.3	*3	....	4	4	....	....	2	*2	....	7R7
7S7	4	19	6.3	*3	....	4	....	....	....	2	*2	....	7S7
Test 2	4	30	6.3	*3	4	....	....	4	4	2	*2	....	Test 2
7V7	4	18	6.3	*3	....	....	....	....	....	2	*2	....	7V7
7W7	4	20	6.3	*3	....	....	*4	....	....	2	*2	....	7W7
12AH7	4	30	12.6	4	2	4	2	....	....	*3	*2	....	12AH7
Test 2	4	30	12.6	....	2	....	2	4	4	*3	*2	....	Test 2
12E5-GT	4	30	12.6	....	*3	....	....	....	....	*2	2	....	12E5-GT
12H6	2	25	12.6	....	*3	4	2	....	....	*2	2	....	12H6
Test 2	2	25	12.6	....	*3	....	2	4	....	*2	2	....	Test 2
12SF7	4	30	12.6	....	....	2	....	4	....	*3	*2	....	12SF7
Test 2	2	53	12.6	....	4	2	4	....	4	*3	*2	....	Test 2
12SG7	4	19	12.6	....	*3	*4	....	2	....	*2	....	....	12SG7
12SH7	4	19	12.6	....	*3	*4	....	2	....	*2	....	....	12SH7
12SL7	4	28	12.6	4	4	2	....	....	2	*3	*2	....	12SL7
Test 2	4	28	12.6	....	....	2	4	4	2	*3	*2	....	Test 2
14A7	4	28	12.6	*3	....	....	....	....	....	2	*2	....	14A7
14E6	4	31	12.6	*3	....	....	*4	4	4	2	*2	....	14E6
Test 2	2	65	12.6	*3	4	4	*4	2	....	2	*2	....	Test 2
Test 3	2	65	12.6	*3	4	4	*4	....	2	2	*2	....	Test 3
14N7	4	28	12.6	*3	....	2	....	....	....	2	*2	....	14N7
Test 2	4	28	12.6	*3	....	....	....	....	2	2	*2	....	Test 2
14S7	4	19	12.6	*3	....	4	....	....	....	2	*2	....	14S7
Test 2	4	30	12.6	*3	4	....	....	4	4	2	*2	....	Test 2
14W7	4	19	12.6	*3	....	....	*4	....	....	2	*2	....	14W7
14Z3	4	25	12.6	*3	....	2	*2	....	....	....	....	....	14Z3
RK-24	3	30	2	*3	....	....	*2	....	....	....	....	....	RK-24
KR-25	4	36	2.5	*3	....	....	....	*2	....	....	....	....	KR-25
25Z3	Inactive by RMA as of May, 1941												25Z3
28D7	4	18	32	*3	4	....	4	....	2	....	*2	....	28D7
Test 2	4	18	32	*3	....	....	....	4	2	4	*2	....	Test 2
28Z5	4	31	32	*3	....	2	*4	....	....	2	*2	....	28Z5
Test 2	4	31	32	*3	....	....	*4	....	2	2	*2	....	Test 2
R-30	3	35	2	*3	....	....	*2	....	....	....	....	....	R-30
RK-33	4	27	6.3	*3	2	....	4	4	2	*2	....	....	RK-33
Test 2	4	27	6.3	*3	2	4	....	....	2	*2	....	4	Test 2
RK-34	4	27	6.3	*3	....	4	2	....	....	*2	....	....	RK-34
	Top cap lead on left top cap												
Test 2	4	27	6.3	*3	....	....	2	4	....	*2	....	....	Test 2
	Top cap lead on right top cap												

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
52	4	30	6.3	*3	....	....	....	*2	....	....	....	....	52
82V	4	24	2.5	*3	2	....	*2	....	....	....	....	....	82V
Test 2	4	24	2.5	*3	....	2	*2	....	....	....	....	....	Test 2
G-84	4	56	2.5	*3	....	....	*2	....	....	....	....	....	G-84
88	4	26	5	*3	2	....	*2	....	....	....	....	....	88
Test 2	4	26	5	*3	....	2	*2	....	....	....	....	....	Test 2
VR-90-30	6	90	"D"	....	2	....	....	....	....	....	....	....	VR-90-30
(Good tube reads 20 — No short test)													
95	4	36	2.5	*3	....	....	....	2	*2	....	....	....	95
98	4	26	6.3	*3	2	....	2	*2	....	....	....	....	98
Test 2	4	26	6.3	*3	....	2	2	*2	....	....	....	....	Test 2
R-100	4	43	7.5	*3	....	....	*2	....	....	....	....	....	R-100
Short top caps together													
HY-114-B	4	55	1.4	....	*3	....	....	....	....	*2	....	....	HY-114-B
Short top caps together													
117N7-GT	4	20	110	....	*3	....	....	....	2	*2	*4	....	117N7-GT
Test 2	4	15	110	....	3	4	4	4	2	2	2	....	Test 2
Allow tube to heat up, return lever K to position 1. Short test based only on first test.													
117P7	4	20	110	....	*3	....	....	....	2	*2	*4	....	117P7
Test 2	4	15	110	....	3	4	4	4	2	2	2	....	Test 2
Allow tube to heat up, return lever K to position 1. Short test based only on first test.													
117Z4-GT	4	19	110	....	*3	....	....	....	....	*2	2	....	117Z4-GT
VR-150-30	6	95	"D"	....	*2	....	....	....	....	....	....	....	VR-150-30
(Good tube reads 10 — No short test)													
182-B	4	37	5	*3	....	....	*2	....	....	....	....	....	182-B
183	4	40	5	*3	....	....	*2	....	....	....	....	....	183
R-200	4	40	7.5	*3	....	....	*2	....	....	....	....	....	R-200
Filament connected from 1 & 4 on 4 pin tester socket to 2 & 4 pin of tube. Short top caps together													
231-D	2	42	3.3	*3	....	....	*2	....	....	....	....	....	231-D
244-A	3	34	2	*3	....	....	2	*2	....	....	....	....	244-A
245-A	3	58	2	*3	....	....	2	*2	....	....	....	....	245-A
252-A*	Not suitable for testing, exceeds 10 watts												*252-A
254-A*	Not suitable for testing, exceeds 10 watts												*254-A
259-A	3	29	2	*3	....	....	2	*2	....	....	....	....	259-A
262-A	3	33	7.5	*3	....	2	*2	....	....	....	....	....	262-A
262-B	3	33	7.5	*3	....	2	*2	....	....	....	....	....	262-B
268-A*	Not suitable for testing, exceeds 10 watts												*268-A
271-A*	Not suitable for testing, exceeds 10 watts												*271-A
274-A	4	36	5	*3	....	2	*2	....	....	....	....	....	274-A
Test 2	4	36	5	*3	2	....	*2	....	....	....	....	....	Test 2
275-A*	Not suitable for testing, exceeds 10 watts												*275-A
283-A	2	34	2	*3	....	....	2	*2	....	....	....	....	283-A
305-E	Not suitable for testing, exceeds 10 watts												305-E
307-A	4	24	5	*3	....	....	....	*2	....	....	....	....	307-A

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
328-A	4	28	7.5	*3	....	....	....	2	*2	....	....	....	328-A
350-A	4	19	6.3	*3	....	....	2	*2	....	....	....	....	350-A
482-A	4	47	5	*3	....	....	*2	....	....	....	....	....	482-A
586	4	42	7.5	*3	....	....	*2	....	....	....	....	....	586
HY-615	3	31	6.3	....	*3	....	....	....	....	*2	2	....	HY-615
				Short top caps together									
713-A	4	20	6.3	....	*3	2	....	2	....	*2	....	....	713-A
				Shows short on G and I.									
717-A	4	20	6.3	....	*3	2	....	2	....	*2	....	....	717-A
				Shows short on G and I.									
801	4	42	7.5	*3	....	....	*2	....	....	....	....	....	801
802	4	29	6.3	*3	....	....	....	....	2	*2	....	....	802
807	4	25	6.3	*3	....	....	2	*2	....	....	....	....	807
809	4	27	6.3	*3	....	....	*2	....	....	....	....	....	809
812	4	29	6.3	*3	....	....	*2	....	....	....	....	....	812
837	4	25	12.6	*3	....	....	....	....	2	*2	....	....	837
840	3	33	2	*3	....	....	....	*2	....	....	....	....	840
841	4	45	7.5	*3	....	....	*2	....	....	....	....	....	841
842	4	54	7.5	*3	....	....	*2	....	....	....	....	....	842
854	2	55	1.4	*3	....	....	*2	....	....	....	....	....	864
865	4	80	7.5	*3	....	....	*2	....	....	....	....	....	865
986	4	26	5	*3	2	....	*2	....	....	....	....	....	986
Test 2	4	26	5	*3	....	2	*2	....	....	....	....	....	Test 2
CK-1005	6	33	12.6	....	....	2	....	....	3	....	2	....	CK-1005
Test 2	6	33	12.6	....	....	....	....	2	3	....	2	....	Test 2
				No short test									
1201	4	20	6.3	*4	*3	....	*4	....	2	*4	*2	....	1201
1203	2	33	6.3	*3	....	....	....	....	....	2	*2	....	1203
1204	4	26	6.3	....	*3	....	2	....	*4	*2	*4	....	1204
1284	4	25	12.6	*3	....	....	....	....	....	2	*2	....	1284
1291†	1	33	1.5	*2	....	....	4	Fil. continuity test only					†1291
1291†	2	33	1.5	2	2	2	3	....	....	....	2	....	†1291
Test 2	2	33	1.5	2	....	....	3	....	2	2	2	....	Test 2
1293	3	32	1.4	*3	....	....	....	....	....	....	*2	....	1293
1294†	2	57	1.5	*3	....	....	....	....	....	2	2	....	†1294
1299	3	25	1.5	*3	....	....	....	....	....	*2	*3	....	1299
1602	4	40	7.5	*3	....	....	*2	....	....	....	....	....	1602
1608	4	24	2.5	*3	....	....	*2	....	....	....	....	....	1608
1610	4	28	2.5	*3	....	....	....	*2	....	....	....	....	1610
1613	4	30	6.3	....	*3	....	....	....	....	*2	2	....	1613
1614	4	24	6.3	....	*3	....	....	....	....	*2	2	....	1614
1616	4	57	2.5	*3	....	....	*2	....	....	....	....	....	1616
1619	4	29	2.5	....	*3	....	....	....	....	*2	2	....	1619
1624	4	23	2.5	*3	....	....	....	*2	....	....	....	....	1624
1625	4	25	12.6	*3	....	....	....	....	2	*2	....	....	1265

Tubes	B	C	D	(1) E	(2) F	(3) G	(4) H	(5) I	(6) J	(7) K	(8) L	(9) M	Tubes
1626	4	32	12.6	....	*3	....	....	....	....	*2	2	....	1626
1629	3	36	12.6	....	*3	....	....	....	....	2	*2	....	1629
Glo Test	5	CL	12.6	....	*3	....	....	2	....	2	*2	....	Glo Test
Glo Test	4	OP	12.6	....	*3	2	....	2	....	2	*2	....	Glo Test
1631	4	27	12.6	....	*3	....	....	....	....	*2	2	....	1631
1632	4	22	12.6	....	*3	....	....	....	....	*2	2	....	1632
1633	4	26	25	....	....	2	4	4	4	*3	*2	....	1633
1634	4	39	12.6	....	4	4	....	....	2	*2	*3	....	1634
2050	4	15	6.3	....	3	....	....	....	....	2	2	....	2050
						No short test							
2051	4	19	6.3	....	3	....	....	....	....	2	2	....	2051
						No short test							
7000	4	25	6.3	....	*3	....	....	....	....	*2	2	....	7000
7193	4	21	6.3	....	*3	....	....	....	....	*2	2	....	7193
						Short top caps together							
7700	4	27	6.3	*3	....	....	....	2	*2	....	....	....	7700
9001	4	27	6.3	....	2	*2	*3	....	....	2	....	....	9001
						Shows short on F & K							
9002	4	27	6.3	....	2	*2	*3	*4	....	2	....	....	9002
						Shows short on F & K							
9003	4	27	6.3	....	2	*2	*3	....	....	2	....	....	9003
						Shows short on F & K							
9004	3	28	6.3	....	*3	....	2	....	....	*2	....	....	9004
9005	2	34	3.3	....	*2	....	2	....	....	*3	*3	....	9005
						Use Acorn Adapter BN							

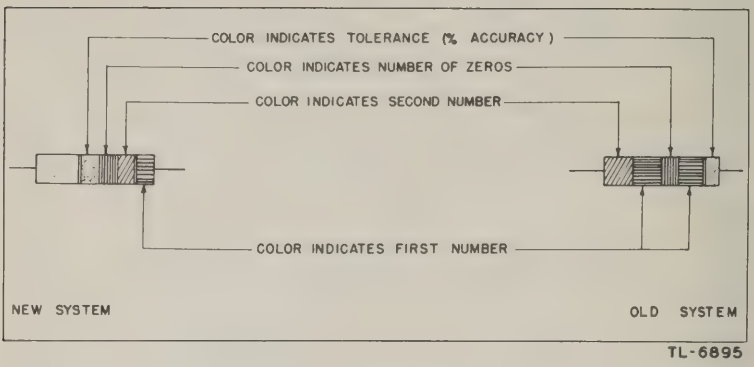

FIG. 38. RESISTOR COLOR-CODE CHART

51. RESISTOR COLOR-CODE CHART.

Color	Number	Color	Number
Black	0	Green	5
Brown	1	Blue	6
Red	2	Violet	7
Orange	3	Gray	8
Yellow	4	White	9

Gold (green) ..... 5% tolerance
Silver (blue) ..... 10% tolerance
None ..... 20% tolerance (standard)

EXAMPLE: A 50,000-ohm resistor of standard tolerance is indicated by a green ring (5), a black ring (0) and an orange ring (000), as shown in the new system of marking in figure 38. In the old system of marking, at the right of figure 38, the resistor would be painted green (5), with a black end (0) and an orange dot or ring in the center (000).

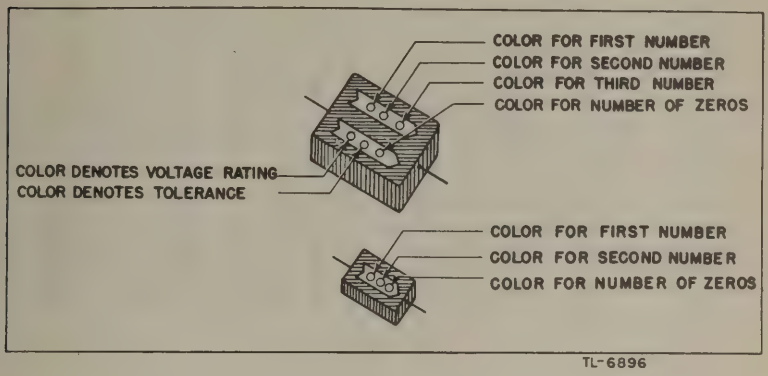

FIG. 39. CAPACITOR COLOR-CODE CHART

52. CAPACITOR COLOR-CODE CHART.

Color	*Number*	*Voltage Rating*
Black	0	—
Brown	1	100
Red	2	200
Orange	3	300
Yellow	4	400
Green	5	500
Blue	6	600
Violet	7	700
Gray	8	800
White	9	900
Gold	5% tolerance	1,000
Silver	10% tolerance	2,000
None	20% tolerance	—

EXAMPLE: A 5,600$\mu\mu$f. (0.0563μf.) capacitor of 10% tolerance and a 500-volt rating is indicated by a green dot (5), a blue dot (6) and an orange dot (3), on the top row; a red dot (00), a silver dot (10% tolerance) and a green dot (500 volts) on the bottom row, arranged in the order shown in figure 39. All capacitance values are given in micromicrofarads ($\mu\mu$f). Small capacitors often use a 3-dot code, shown in figure 39.

53. TABLE OF REPLACEABLE PARTS FOR TEST SETS I-56-C AND I-56-J.

a. Model 1183-SC Combination Tester. [Model 1183-SC (C), Signal Corps stock number 3F4072-2; Model 1183-SC(J), Signal Corps stock number 3F4072-2.1].

NOTE: Order replacement parts by stock number, name and description.

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
	2Z307	Adapter, 4-prong tube connection	Connects tubes and tester
	2Z307-1	Adapter, 5-prong tube connection	Connects tubes and tester
	2Z307-2	Adapter, 6-prong tube connection	Connects tubes and tester
	2Z307-3	Adapter, 7-prong (small) tube connection	Connects tubes and tester
	2Z307-4	Adapter, 7-prong (large) tube connection	Connects tubes and tester
	2Z307-5	Adapter, 8-prong (octal) tube connection	Connects tubes and tester
	2Z307-6	Adapter, 8-prong (loctal) tube connection	Connects tubes and tester
	3F4056C/A2	Adapter, acorn-type-BN tube connection	Connects tubes and tester
	3A2	Battery BA-2, 22-1/2-volt	Supplies current for ohmmeter ranges
	3A30	Battery BA-30, 1-1/2-volt	Supplies current for ohmmeter ranges
C-2	3DA500-111	Capacitor, paper, 0.5μf., $\pm$20%, 400-v.	Blocks direct current
C-3	3DA100-109.1	Capacitor, paper, 0.1μf., $\pm$20%, 200-v.	Couples capacitance for electrode short and leakage tests
	3Z1087	Clip, alligator	Connects to test prods

J-5(C)	2Z5581-6	Jack, double-contact red bakelite	Free-point test terminal
*J-6(C)	2Z5581-5	Jack, black bakelite	Free-point test terminal
J-6(J)	3F4072-2/J1	Jack assembly	Free-point test terminal
	3F4072-2/C2	Cover, jack assembly	Free-point test terminal cover
J-7	2Z5581-4	Jack, red bakelite	+V-O-MA and capacitance-test terminal
J-8	2Z5581-5	Jack, black bakelite	V-O-MA, CAP, and OUTPUT terminal
	2Z5838	Knob, bar type, with white indicator, 1-1/4"	For controls A, B, C, and D
	2Z5193	Lamp, neon, 1/10-watt	Short and leakage indicator for tube tests
	3F38528/C4	Line cord	Connects tester to power source
M-3	3F4072-2/M2	Meter (1183-SC), 100μa., 100mv., 1,000-ohm, Triplett model 426	Indicator meter
	3F4072-2/M1	Meter, line-voltage, 0-30-volt, a-c, Triplett part 10239	Indicates line voltage adjustment
(C)-1	2Z5581-6/2	Nut, jack, hexagonal, black bakelite	Secures black jacks to panel
(C)-1	2Z5581-6/1	Nut, jack, hexagonal, red bakelite	Secures red jacks to panel
CAB-1	3F4072-2P/1	Assembly plug and cable, 9-conductor, 5' long, cotton-covered, with octal analyzer plug	For free-point test connections
RE-3	3F4072-2/R1	Rectifier, copper-oxide, plug-in, type B-2(H)	Changes alternating current to proportional direct current

* In Model 1183-SC(C) only.

53a. *Model 1183-SC Combination Tester (continued)*

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
R-30(J)	2Z7286.8	Potentiometer, 200-, 600-, and 62,300-ohm sections	62,300- and 600-ohm section for zero adjustments; 200-ohm section for tube tester load control
R-30(C)	3F4056C/P1	Potentiometer, dual, 200-ohm section at front, 62,322-ohm section at rear, wire-wound	62,322-ohm section for zero adjustments; 200-ohm section for tube tester load control
R-31	3Z5984-1	Resistor, wire-wound, 0.425-ohm, ±1%, 1-watt	Shunt resistor, 250MA scale
R-32	3Z6017F6-2	Resistor, wire-wound, 176.7-ohm, ±1%, 1-watt	Shunt resistor, 150M scale
R-33	3Z6719	Resistor, carbon, 190,000-ohm, ±1-1/2%, 1-watt, check at 80μa.	Resistance multiplier, 15MEG scale.
R-34	3Z6619	Resistor, carbon, 19,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 800μa.	Resistance multiplier, 1.5MEG scale
R-35	3Z6190-1	Resistor, carbon, 1,900-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Resistance multiplier, 150M scale
R-36	3Z6618G7-1	Resistor, carbon, 18,750-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Voltage multiplier, 1,000V, 500V, 250V, 50V, 10V A.C. scales
R-37	3Z6680-10	Resistor, carbon, 80,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Voltage Multiplier, 1,000V, 500V, 250V, 50V A.C. scales
R-38	3Z6740-2	Resistor, carbon, 400,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Voltage multiplier, 1,000V, 500V, 250V A.C. scales
R-39	3Z6740-2	Resistor, carbon, 400,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 80μa.	Voltage multiplier, 1,000V, 500V, 250V, 50V D.C. scales

R-40	3Z6750-42	Resistor, carbon, 500,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Voltage multiplier, 1,000V, 500V, A.C. scales
R-41, -42	3Z6750-42	Resistor, carbon, 500,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 400μa.	Voltage multiplier, 1,000V A.C. scale
R-43	3Z6802A5-4	Resistor, carbon, 2.5-megohm, +1/2%, −1-1/2%, 1-watt; check at 80μa.	Voltage multiplier, 1,000V, 500V, D.C. scales
R-44, -45	3Z6802A5-4	Resistor, carbon, 2.5-megohm, +1/2%, −1-1/2%, 1-watt; check at 80μa.	Voltage multiplier, 1,000V D.C. scale
R-46	3Z6699	Resistor, carbon, 99,000-ohm, +1/2%, −1-1/2%, 1-watt; check at 80μa.	Voltage multiplier, 10V D.C. scale
R-47	3Z6005-52	Resistor, wire-wound, 50-ohm, ±1%, 1-watt	Multiplier resistor, tube tests
R-48	3Z6150-56	Resistor, wire-wound, 1,500-ohm, ±1%, 1-watt	Current-limiting resistor, AMP. and RECT. tube
R-49	3Z6043-3	Resistor, wire-wound, 430-ohm, ±1%, 1-watt	Current-limiting resistor, battery tube test
R-50	3Z6030-48	Resistor, wire-wound, 300-ohm, ±1%, 1-watt	Shunt for capacity measurements
R-51	3Z6001H8-1	Resistor, wire-wound, 18-ohm, ±1%, 1-watt	Current-limiting resistor, diode tube test
R-52	3Z6011A1	Resistor, wire-wound, 111.1-ohm, ±1%, 1-watt	Shunt resistor for tube tests
R-53	3Z6011D4	Resistor, wire-wound, 114.4-ohm, ±1%, 1-watt	Shunt resistor for 1MA D.C. scale
R-54	3Z6011A1	Resistor, wire-wound, 111.1-ohm, ±1%, 1-watt	Shunt resistor for 1.5MEG scale
R-55(C)	3Z6006C1-1	Resistor, wire-wound, 63-ohm, ±1%, 1-watt	Multiplier resistor, 500-ohm scale
†R-55(J)	3Z6002-26	Resistor, wire-wound, 20-ohm, ±1%, 1-watt	Multiplier resistor, 500-ohm scale

† In Model 1183-SC(J) only.

53a. *Model 1183-SC Combination Tester (continued)*

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
R-56	3Z6725-17	Resistor, carbon, 250,000-ohm, ±10%, 1/2-watt	Shunt resistor for neon lamp
R-58	3Z6500-59	Resistor, wire-wound, 5,000-ohm, ±10%, 10-watt	Current-limiting resistor, glow and gaseous-rectifier tests
R-59	3Z6001-30	Resistor, wire-wound, 10.38-ohm, ±1%, 1-watt	Shunt resistor for 10MA scale
R-60	3Z5995-11	Resistor, wire-wound, 5.025-ohm, ±1%, 1-watt	Shunt resistor for 500-ohm scale
R-61	3Z5992-11	Resistor, wire-wound, 2.07-ohm, ±1%, 1-watt	Shunt resistor for 50MA D.C. scale
R-65	3Z6802-19	Resistor, carbon, 2-megohm, +1/2%, −1-1/2%, 1-watt; check at 80μa.	Voltage multiplier 1,000V, 500V, 250V D.C. scales
R-70	3Z6700-2	Resistor, carbon, 100,000-ohm, ±10%, 1/10-watt	Current-limiting resistor, neon lamp circuit
R-71	3Z4528	Resistor, carbon, 5,000-ohm, ±10%, 1/2-watt	Current-limiting resistor, diode tube test
R-72	3Z4525	Resistor, carbon, 1,000-ohm, ±10%, 1/2-watt	Current limiting resistor, battery tube test
R-73	3Z6250-45	Resistor, wire-wound, 2,500-ohm, ±1%, 1-watt	Line-meter series resistor
R-29	3Z7164	Rheostat, variable, wire-wound, 164-ohm, 25-watt	Adjusts line voltage
SO-1	2Z8659-3	Socket, tube, 4-prong, black, bakelite	Socket for tube testing
SO-2	2Z8687	Socket, tube, 5-prong, black, bakelite	Socket for tube testing
SO-3	2Z8688	Socket, tube, 6-prong, black, bakelite	Socket for tube testing
SO-4	2Z8677.6	Socket, tube, 7-prong, black, bakelite	Socket for tube testing

SO-5	2Z8670.6	Socket, tube, octal, black, bakelite	Socket for tube testing
SO-6	2Z8678.21	Socket, tube, loctal, black, bakelite	Socket for tube testing
SO-7	2Z8677.5	Socket, tube, miniature 7-prong, black, bakelite	Socket for tube testing
SO-8	2Z8676.2	Socket, tube, Bantam 6-prong, black, bakelite	Socket for tube testing
SO-9	2Z8675.7	Socket, tube, midget 5-prong, black, bakelite	Socket for tube testing
S-3(C)	3F4072-2/S2	Switch, selector, 9-lever, single-pole, 4-position	Slide switches for tube tests
S-3(J)	3Z9903A-5.1	Switch, 9-lever, single-pole, 4-position, circuit-selector	Slide switches for tube tests
S-5(C)	3F4072-2/S1	Switch, rotary, 5-wafer, nonshorting, circuit-selector	Control B circuit selector
S-5(J)	3Z9825-56.5	Switch, rotary, 5-wafer, 14-position, circuit selector	Control B circuit selector
S-6(C)	3F9825-56.2	Switch, rotary, 5-wafer, 20-position, circuit-selector	Control D circuit selector
S-6(J)	3Z9825-56.6	Switch, rotary, 5-wafer, 20-position, circuit-selector	Control D circuit selector
	3Z4056C/L2	Test leads (1 red, 1 black), 4', #18 AWG, with prods	To make test connections
T-1	3Z9613.27	Transformer, power, 117-v., a-c, 60-cycle	Supplies various a-c voltages to the tester
	3F4072-2/C1	Tube chart, complete set	Tube testing data

b. Model 666-SC Volt-Ohm Tester. (Model 666-SC in Test Set I-56-C, Signal Corps stock number 3F4056C/V1; Model 666-SC in Test Set I-56-J, Signal Corps stock number 3F4056C/V1.)

	3A31	Battery BA-31, 4-1/2 volts	Supplies current for ohmmeter
	3F2534	Case, black, bakelite	Contains meter and parts
J-1	2Z5581-5	Jack, black, bakelite	Negative terminal

53b. *Model 666-SC Volt-Ohm Tester (continued)*

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
J-2	2Z5581-4	Jack, red, bakelite	Positive terminal
	3F4056C/K1	Knob, round, black, bakelite	Ω ADJUST knob
	2Z5838	Knob, bar type, black, bakelite	Circuit selector knob
M-1	3F6322	Meter, 100μa., 100mv., 1,000-ohm	Indicating meter
	3F14001/P1	Panel, black, bakelite	Supports meter and parts
R-1	2Z7268.14	Potentiometer, wire-wound, 1,000-ohm, ±10%, 1-watt, Stackpole type PSM	Battery adjustment for ohmmeter
R-2	3Z6287-1	Resistor, carbon, fixed, 2,870-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Ohmmeter series resistor, R x 100 scale
R-3	3Z6031A5-2	Resistor, carbon, fixed, 315-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Ohmmeter shunt resistor
R-4	3Z6631	Resistor, carbon, fixed, 31,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 80μa.	Ohmmeter series resistor, R x 100 scale
R-5	3Z6315-1	Resistor, carbon, fixed, 3,150-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Ohmmeter shunt resistor
R-6	3Z6333C3	Resistor, carbon, 3,333-ohm, +1/2%, −1-1/2%, 1/2-watt	For calibrating shunt for voltage ranges
R-7	3Z6627-15	Resistor, carbon, fixed, 27,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Voltage series resistor, 30V, 300V, 600V, and 1,000V ranges
R-8	3Z6629	Resistor, carbon, 29,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 80μa.	Voltage series resistor

R-9	3Z6727-13	Resistor, carbon, fixed, 270,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Voltage series resistor
R-10	3Z6730-14	Resistor, carbon, fixed, 300,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Voltage series resistor
R-11, -12	3Z6790	Resistor, carbon, fixed, 900,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Voltage series resistor
R-13, -14	3Z6002-J9	Resistor, wire-wound, spool-type, 3.5- and 26-ohm, +1/2%, −1-1/2%, 5-watt	3.5-ohm section is ohmmeter shunt; 26-ohm section is ohmmeter series resistor
R-15, -16	3Z6031A1	Resistor, wire-wound, spool-type, 280- and 21.5-ohm, +1/2%, −1-1/2%	31.5-ohm section is ohmmeter shunt; 280-ohm section is ohmmeter series resistor
S-1	3Z9825-56.4	Switch, rotary, 2-gang, single-pole, 9-position	Circuit selector
	3Z4056/L1	Test leads, set, complete with test prods	For making test connections

c. *Model 650-SC Output Meter.* (Model 650-SC in Test Set I-56-C, Signal Corps stock number 3F3324-2; Model 650-SC in Test Set I-56-J, Signal Corps stock number 3F3324-2.)

C-1	3DA500-111	Capacitor, paper, tubular, 0.5μf., 400-v.	Blocking capacitor
	3F2534	Case, black, bakelite	Contains meter and parts
J-1	2Z5581-5	Jack, black, bakelite	VOLTS and SERIES COND. terminal
J-2	2Z5581-4	Jack, red, bakelite	± terminal
	2Z5838	Knob, bar type	Selector switch knob
M-2	3F6321	Meter (650-SC), 100μa., 100mv., 1,000-ohm	Indicating meter

53c. *Model 650-SC Output Meter (continued)*

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
	3F3324-2/P1	Panel, black, bakelite	Supports meter and parts
RE-1	3H4702-1	Rectifier, copper-oxide, type B-2	Changes a-c to proportional d-c voltage
R-18	3Z6503C3	Resistor, carbon, 5,333-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Series impedance-matching resistor, 6V scale
R-19	3Z6440D-4	Resistor, carbon, 4,444-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 800μa.	Series impedance-matching resistor, 15V scale
R-20	3Z6624-4	Resistor, carbon, 24,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 300μa.	Series resistor, 150V, 60V, and 15V scales
R-21	3Z6712-8	Resistor, carbon, 120,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 300μa.	Series resistor, 60V and 150V scales
R-22	3Z6724-8	Resistor, carbon, 240,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 300μa.	Series resistor, 150V scale
R-23	3Z6190-9	Resistor, carbon, 1,600-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 300μa.	Series resistor, all scales
R-24	3Z6410C3	Resistor, wire-wound, 4,103-ohm, +1/2%, −1-1/2%, 1-watt; check at 800μa.	Series impedance-matching resistor, 60V scale
R-25	3Z6133D4	Resistor, wire-wound, 4,000-ohm, ±5%, 10-watt; check at 800μa.	Series impedance-matching resistor, 150V scale
R-26	3Z6100-108	Resistor, wire-wound, 1,000-ohm, +1/2%, −1-1/2%, 1-watt	Meter calibrating shunt
R-27	3Z6200-6	Resistor, carbon, 2,000-ohm, ±5%, 1/2-watt	Rectifier voltage-dividing resistor

R-28	3Z6612-25	Resistor, carbon, 12,000-ohm, +1/2%, −1-1/2%, 1/2-watt; check at 300μa.	Series resistor, 150V, 60V, 15V and 6V scales
S-2	3Z9825-56.3	Switch assembly, range, 2-gang, 6-position	Range selector

54. TABLE OF REPLACEABLE PARTS FOR TEST SETS I-56-D AND I-56-H.

a. Model 104 Combination Tester. (Signal Corps stock number 3F4072-11.)

NOTE: Order replacement parts by stock number, name and description.

	2Z307	Adapter, 4-prong tube connection	Connector for free-point tests
	2Z307-1	Adapter, 5-prong tube connection	Connector for free-point tests
	2Z307-2	Adapter, 6-prong tube connection	Connector for free-point tests
	2Z307-3	Adapter, 7-prong (small) tube connection	Connector for free-point tests
	2Z307-4	Adapter, 7-prong (large) tube connection	Connector for free-point tests
	2Z307-5	Adapter 8-prong (octal) tube connection	Connector for free-point tests
	2Z307-6	Adapter, 8-prong (loctal) tube connection	Connector for free-point tests
	3F4056C/A2	Adapter, acorn-type-BN tube connection	Connector for free-point tests
	3A2	Battery BA-2, 22-1/2-volt	Supplies current for ohmmeter ranges
	3A30	Battery BA-30, 1-1/2-volt	Supplies current for ohmmeter ranges
C-2	3D88	Capacitor, paper, 0.5μf., ±10%, 400-v.	Blocks direct current
C-3	3DA100-109.1	Capacitor, paper, .1μf., ±10%, 200-v.	Couples capacitance for electrode short and leakage tests

54a. *Model 104 Combination Tester (continued)*

Ref. No.	*S. C. stock No.*	*Name of part and description*	*Function*
	3Z1087	Clip, alligator	
J-5	2Z5560-2	Jack, red, bakelite, hexagonal nut, pin connector	Free-point test terminal
J-6	2Z5560-1	Jack, black, bakelite, hexagonal nut, pin connector	Free-point test terminal
J-7	2Z5581-4	Jack, red, bakelite, round-pin connector	+V-O-MA and capacitive test terminal
J-8	2Z5581-5	Jack, black, bakelite, round-pin connector	V-O-MA, CAP and OUTPUT terminal
	2Z5748.4	Knob, black, croplastic, white line	Controls A and B knobs
	2Z5748-4	Knob, black, bakelite, with white line	Controls D knob
	2Z5838	Knob, black, croplastic, white indicator	Controls C knob
B-1	2Z5889-2	Lamp, neon, 1/10-watt	Short and leakage indicator for tube tests
	3F3852H/C4	Line cord, 8′, 2-conductor, #18 AWG, black rubber with molded plug	Connects tester to power source
M-3	3F14000-2	Meter, 100μa., 100mv., d-c, 4″, G. E. type DO58	Indicator meter
CAB-1	3F4056A/A17	Plug and cable assembly	Free-point test connections
RE-2, -3	3F4072-2/R1	Rectifier, copper-oxide, full-wave, plug-in, type B-2	Changes a-c to proportional d-c
R-29	3Z7164	Rheostat, 164-ohm, ceramic-coated, wire-wound	Line voltage control "A"
R-30	3F4056C/P1	Rheostat, dual control, 200-ohm and 60,000-ohm, wire-wound	Ohms adjust and line check adjust, control "C"

R-31	3Z5984-1	Resistor, 400-ohm, 1-watt, wire-wound	Shunt resistor, 250MA scale
R-32	3Z6017F6-2	Resistor, 176.7-ohm, 2-watt, wire-wound	Shunt resistor, 150M ohms scale
R-33	3Z6719-1	Resistor, fixed, 190,000-ohm, 1-watt	Ohms multiplier, 15MEG scale
R-34	3Z6619-1	Resistor, fixed, carbon, 19,000-ohm, ±2%, 1-watt, glass sealed	Ohms multiplier, 1.5MEG scale
R-35	3Z6190-3	Resistor, fixed, carbon, 1,900-ohm, ±2%, 1-watt, glass sealed	Ohms multiplier, 150M scale
R-36	3Z661867-1	Resistor, fixed, carbon, 18,750-ohm, ±1%, 1-watt	Voltage multiplier for all A.C. scales
R-37	3Z6680-12	Resistor, fixed, carbon, 80,000-ohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V, 250V, 50V, and 10V A.C. scales
R-38	3Z6740-5	Resistor, fixed, carbon, 400,000-ohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V, 250V A.C. scales
R-39	3Z6740-5	Resistor, fixed, carbon, 400,000-ohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V, 250V, 50V D.C. scales
R-40	3Z6750-45	Resistor, fixed, carbon, 500,000-ohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V, A.C. scales
R-41, -42	3Z6750-45	Resistor, fixed, carbon, 500,000-ohm, ±1%, 1-watt	Voltage multiplier, 1,000V A.C. scale
R-43	3Z6802A5-5	Resistor, fixed, carbon, 2.5-megohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V D.C. scales
R-44, -45	3Z6802A5-5	Resistor, fixed, carbon, 2.5-megohm, ±1%, 1-watt	Voltage multiplier, 1,000V D.C. scale
R-46	3Z6699-1	Resistor, fixed, carbon, 99,000-ohm, ±1%, 1-watt	Voltage multiplier, 10V D.C. scale
R-47	3Z6005-57	Resistor, fixed, wire-wound, 50-ohm, ±1%, 1-watt	Multiplier resistor, tube tests
R-48	3Z6150-65	Resistor, fixed, wire-wound, 1,500-ohm, ±1%, 1-watt	Current-limiting resistor, ampere and rectifier-tube tests

54a. Model 104 Combination Tester (continued)

Ref. No.	S. C. stock No.	Name of part and description	Function
R-49	3Z6043-4	Resistor, fixed, wire-wound, 430-ohm, ±1%, 1-watt	Current-limiting resistor, battery-tube tests
R-50	3Z6043-58	Resistor, fixed, wire-wound, 300-ohm, ±1%, 1/2-watt	Shunt for capacity measurements
R-51	3Z6001H8-4	Resistor, fixed, wire-wound, 18-ohm, ±1%, 1-watt	Current-limiting resistor, diode-tube test
R-52	3Z6011A1-1	Resistor, adjustable, wire-wound, 111.1-ohm, ±1%, 1-watt	Shunt resistor for tube tests
R-53	3Z6011A1-1	Resistor, adjustable, wire-wound, 111.1-ohm, ±1%, 1-watt	Shunt resistor for 1MA D.C. scale
R-54	3Z6011A1-1	Resistor, adjustable, wire-wound, 111.1-ohm, ±1%, 1-watt	Shunt resistor for 1.5MEG scale
R-55	3Z4576	Resistor, fixed, carbon, 63-ohm, ±5%, 1/2-watt	Multiplier resistor, 500-ohm scale
R-56	3Z6725-1	Resistor, fixed, carbon, 250,000-ohm, ±20%	Shunt resistor for neon lamp
R-58	3Z6500-16	Resistor, fixed, wire-wound, 5,000-ohm, 10-watt	Current limiting resistor, glow and gaseous rectifier tests
R-59	3Z6001-30	Resistor, adjustable, wire-wound, 10.1-ohm, ±1%, 1-watt	Shunt resistor for 10MA scale
R-60	3Z5995-11	Resistor, adjustable, wire-wound, 5.025-ohm, ±1%, 1-watt	Shunt resistor for 500-ohm scale
R-61	3Z5992-11	Resistor, adjustable, wire-wound, 2.07-ohm, ±1%, 1-watt	Shunt resistor for 50MA D.C. scale
R-62	3Z6005-52	Resistor, adjustable, wire-wound, 0-50-ohm, ±1%, 1-watt	Meter calibration resistor
R-63	3Z6630-4	Resistor, 25,000 to infinity, 1-watt	Meter calibration resistor
R-64	3Z6610-7	Resistor, fixed, carbon, 10,000-ohm, ±10%, 1/2-watt	Limits input to line voltage rectifier

R-65	3Z6802-19	Resistor, fixed, carbon, 2-megohm, ±1%, 1-watt	Voltage multiplier, 1,000V, 500V, 250V D.C. scales
R-66	2Z7291-3	Rheostat, wire-wound, 1,000-ohm, 1-watt, screwdriver control, without switch	Rectifier circuit line check resistor
R-67	3Z6010-3	Resistor, fixed, carbon, 100-ohm, ±10%, 1/2-watt	10MFD capacitance measuring circuit series resistor
R-68	3Z6200-17	Resistor, fixed, carbon, 2,000-ohm, ±10%, 1/4-watt	1MFD capacitance measuring circuit series resistor
R-69	3Z6300-5	Resistor, fixed, carbon, 2,200-ohm, ±5%, 1/2-watt	Limits input to line voltage rectifier
R-70	3Z6700-15	Resistor, fixed, carbon, 100,000-ohm, ±10%, 1/4-watt	Current-limiting resistor, neon lamp circuit
R-71	3Z4527	Resistor, fixed, carbon, 5,000-ohm, ±5%, 1/2-watt	Current-limiting resistor, diode tube test
R-72	3Z6100-15	Resistor, fixed, carbon, 1,000-ohm, ±5%, 1/4-watt	Current-limiting resistor, battery tube test
SO-1	2Z8674.8	Socket, tube, 4-prong, black, bakelite	For tube testing
SO-2	2Z8687	Socket, tube, 5-prong, black, bakelite	For tube testing
SO-3	2Z8688	Socket, tube, 6-prong, black, bakelite	For tube testing
SO-4	2Z8677.6	Socket, tube, 7-prong, black, bakelite	For tube testing
SO-5	2Z8799-137	Socket, tube, 8-prong, octal, black, bakelite	For tube testing
SO-6	2Z8678.21	Socket, tube, 8-prong, loctal, black, bakelite	For tube testing
SO-7	2Z8677.5	Socket, tube, 7-prong, miniature button	For tube testing

54a. *Model 104 Combination Tester (continued)*

Ref. No.	S. C. stock No.	Name of part and description	Function
SO-8	2Z8675.20	Socket, tube, 5-prong, midget	For tube testing
SO-9	2Z8675.20	Socket, tube, 5-prong, hearing aid	For tube testing
S-3	3Z9824-41	Switch, slide, single-pole, 4-position	For tube tests
S-5	3Z9825-70.3	Switch, range, 4-wafer 10-position,	Control B circuit selector
S-6	3Z9825-70.2	Switch, range, 9-wafer, 20-position	Control D circuit selector
	3Z4056C/L2	Test leads (1 red, 1 black), #18 AWG, rubber-covered, with prod and alligator clip	To make test connections
T-1	3Z9613.27	Transformer, power, 117-volt, a-c, 60-cycle	Supplies various a-c voltages to the tester
	3F4072-11/C1	Tube chart, complete set	Tube testing data

b. *Model 102 Volt-Ohm Tester.* (Signal Corps stock number 3F14002.)

	3A31	Battery BA-31, 4-1/2-volt	Supplies current for ohmmeter
	3F2534	Case, black, bakelite	Contains meter and parts
J-1	2Z5581-5	Jack, tip, black, bakelite	Negative terminal
J-2	2Z5581-4	Jack, tip, red, bakelite	Positive terminal
	2Z5748.4	Knob, indexing, bar type, black croplastic	Circuit selector knob
	3F4056C/K1	Knob, Ω ADJUST, round, black, croplastic	Ω ADJUST knob
M-1	3F14000-1	Meter, 100μa., 100mv., d-c, ±2%	Indicating meter

	3F14001/P1	Panel, black, bakelite	Supports meter and parts
R-1	3Z7310-3	Rheostat, midget, 1,000-ohm, carbon	Battery adjustment for ohmmeter
R-2	3Z6287-1	Resistor, fixed, carbon, 2,870-ohm, ±2%, 1/2-watt	Ohmmeter series resistor R x 100 scale
R-3	3Z6031A5-2	Resistor, fixed, carbon, 315-ohm, ±2%, 1/2-watt	Ohmmeter shunt resistor
R-4	3Z6631-1	Resistor, fixed, carbon, 31,000-ohm, ±2%, 1/2-watt	Ohmmeter series resistor R x 1,000 scale
R-5	3Z6315-2	Resistor, fixed, carbon, 3,150-ohm, ±2%, 1/2-watt	Ohmmeter shunt resistor
R-6	3Z6333C3-2	Resistor, fixed, carbon, 3,333-ohm, ±1%, 1/2-watt	Calibrating shunt for voltage ranges
R-7	3Z6627-17	Resistor, fixed, carbon, 27,000-ohm, ±2%, 1/2-watt	Voltage multiplier resistor, 30V, 300V, 600V and 1,800V ranges
R-8	3Z6629	Resistor, fixed, carbon, 29,000-ohm, ±2%, 1/2-watt	Voltage multiplier resistor, all voltage ranges
R-9	3Z6727-16	Resistor, fixed, carbon, 270,000-ohm, ±2%, 1/2-watt	Voltage multiplier resistor, 300V, 600V and 1,800V ranges
R-10	3Z6730-18	Resistor, fixed, carbon, 300,000-ohm, ±2%, 1/2-watt	Voltage multiplier resistor, 600V and 1,800V ranges
R-11, -12	3Z6730-14	Resistor, fixed, carbon, 600,000-ohm, ±2%, 1-watt	Voltage multiplier resistor, 1,800V range
R-13	3Z6002E6-1	Resistor, fixed, wire-wound, 26-ohm, ±1%, 1/4-watt	Ohmmeter series resistor R x 1 scale
R-14	3Z5993-10	Resistor, fixed, wire-wound, 3.5-ohm, ±1%, 1/4-watt	Ohmmeter shunt resistor
R-15	3Z6003A1-1	Resistor, fixed, wire-wound, 31.5-ohm, ±1%, 1/4-watt	Ohmmeter shunt resistor
R-16	3Z6028-2	Resistor, fixed, wire-wound, 280-ohm, ±1%, 1/4-watt	Ohmmeter series resistor, R x 10 scale

54c. *Model 103 Output Meter (continued)*

Ref. No.	S. C. stock No.	Name of part and description	Function
S-1	3Z9825-56.4	Switch, range, 9-position, single-pole, 2-wafer	Circuit selector
		c. *Model 103 Output Meter.* (Signal Corps stock number 3F3324-3.)	
C-1	3D88	Capacitor, paper, tubular, 0.5μf., ±10%, 400-v., d-c	Series blocking capacitor
	3F2534	Case, black, bakelite	Contains meters and parts
J-1	2Z5581-5	Jack, black, bakelite, Eby type #52	VOLTS and SERIES COND. terminal
J-2	2Z5581-4	Jack, red, bakelite, Eby type #52	± terminal
	2Z5784	Knob, multiplier-control, black, croplastic	Selector switch knob
M-2	3F3324-4	Meter, 100μa., 100mv., d-c, ±2%	Indicating meter
	3F3324-2/P1	Panel, black, bakelite	Supports meter and parts
RE-1	3H4702-1	Rectifier, copper-oxide, full-wave, type B-2	Changes a-c to proportional d-c voltage
RE-18	3Z6503C3-1	Resistor, fixed, carbon, 5,333-ohm, ±2%, 1/2-watt	Series impedance-matching resistor, 6V scale.
RE-19	3Z6444D4	Resistor, fixed, carbon, 4,444-ohm, ±2%, 1/2-watt	Series impedance-matching resistor, 15V scale
RE-20	3Z6624-6	Resistor ,fixed, carbon, 24,000-ohm, ±2%, 1/2-watt	Series resistor, 150V, 60V, 15V scales
RE-21	3Z671-2-14	Resistor, fixed, carbon, 120,000-ohm, ±2%, 1/2-watt	Series resistor, 60V and 150V scales

RE-22	3Z6724-9	Resistor, fixed, carbon, 240,000-ohm, ±2%, 1/2-watt	Series resistor, 150V scale
RE-23	3Z6160-16	Resistor, fixed, carbon, 1,600-ohm, ±2%, 1/2-watt	Series resistor, all scales
RE-24	3Z6410C3-1	Resistor, fixed, carbon, 4,130-ohm, ±1%, 2-watt	Series impedance-matching resistor, 60V scale
RE-25	3Z6200-B2	Resistor, fixed, carbon, 2,002-ohm, ±1%, 4-watt	Series impedance-matching resistor, 150V scale
RE-26	3Z6100-108	Resistor, wire-wound, 1,000-ohm, 1-watt	Meter calibrating resistor
RE-27	3Z6200-1	Resistor, fixed, carbon, 2,000-ohm	Rectifier voltage-dividing resistor
RE-28	3Z6612-30	Resistor, fixed, carbon, 12,000-ohm	Series resistor, 150V, 60V, 15V, 6V scales
S-2	3Z9825-70.1	Switch, range, 6-position, wafer-type	Range selector

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25000, March 44